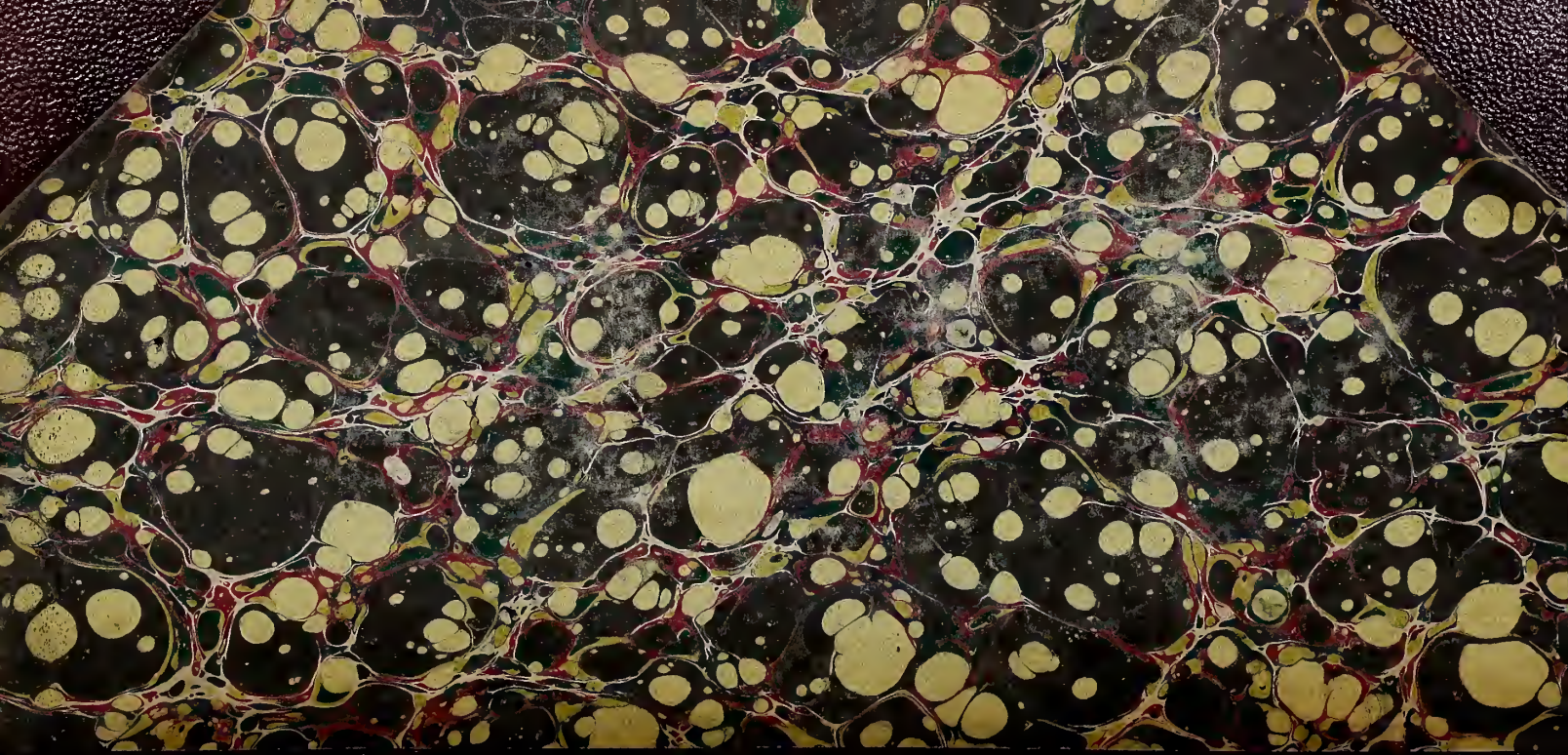

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Report to the Secretary of the Board of Customs, Salt and Opium, on the Salts, called PUCKWAH *and* PHOOL-KHAREE ; *with a process for detecting the adulteration of Government Salt ; estimates of the quantities of both Salts annually produced, and of the amount of loss which the Revenue may sustain through the production of these two articles. By* HENRY PIDDINGTON, ESQ.

As requested, I have now the honor to submit my report on the samples of PUCKWAH and PHOOL-KAREE Salts which I have examined, together with such considerations as have occurred to me in the course of the investigation.

From what I have learnt of the points desirable to be ascertained, and for more convenient reference, I have divided my report as follows:—

I. Constituents of the two Salts.

II. Means of detecting the adulteration of Government Salt.

III. Chemical demonstration of the certainty of this method.

IV. Estimate of the quantity of PUCKWAH produced annually.

V. Estimate of the quantity of PUCKWAH, or edible Salt, annually produced in the preparation of the KHAREE, and of the quantity of KHAREE annually produced.

VI. Estimate of the loss to the Revenue by the PUCKWAH and PHOOL-KHAREE.

VII. Concluding remarks.

I.—*Constituents of the Salts.*

The PUCKWAH is mostly produced during the manufacture of Saltpetre, and sold openly in the bazars for culinary purposes. The Phool-Kharee is manufactured from the efflorescence on the surface of various earths, and sold, as well as other inferior sorts of Kharee, ostensibly for feeding cattle and manufacturing processes,* such as curing hides and the like: the former sort, or PHOOL-KHAREE, really for the purpose of adulterating Government Salt. I mention these few facts preliminarily, though well known to you, as I shall have occasion to recur to them again.

Puckwah.

The effects of reagents on the solution are as follows:—

Tests.	Shewing Acids.	Shewing Bases.
Muriatic acid, ...	No Carbonates,	———
Nitrate Silver, ...	Muriatic, (abundant,)	———
Acetate Barytes, ...	Sulphuric,	———
Gold Leaf,...	Nitric, (trace,)	———
N. M. Platina, ...		No Potass
Oxal. Ammonia, ...		Lime, (trace,)
Phosphate Soda & Ammonia, ...		Magnesia.

Its constituents were found to be in 100 *parts, taken in its usual state,*

Insoluble matter, ...	1.20
Extraneous Salts soluble in Alcohol, principally Muriates of Magnesia and Lime, ...	15.35
Sulphate Soda, dry, ...	2.45
Muriate Soda, ...	75.00
Traces Nitrates, Lime, Soda, and Magnesia,...	0.50
Hygrometric water and loss, ...	5.50
	100.00

The essential parts of this, for revenue purposes are, in briefer terms, that the Puckwah contains 75 per cent. of culinary salt, and that

* Report to the Board, says, there are three sorts, "PHOOL-KHAREE," or refined KHAREE; "BHE'R-KHAREE," or sheep's KHAREE; and "CHOOMAR-KHAREE," or CURRIER'S-KHAREE.

its bitter taste is owing to the Muriates of Magnesia and Lime and the Sulphate of Soda.

Phool-Kharee.

Tests.	Shewing Acids.	Shewing Bases.
Muriatic Acid, ...	No Carbonates,	———
Nitrate Silver, ...	Muriatic,	———
Acetate Barytes, ...	Sulphuric,	———
Gold Leaf, ...	No Nitric,	———
N. M. Platina, ...		No potass,
Oxal. Ammonia, ...		Trace Lime,
Phosphate Soda and Ammonia, ...		Do. Magnesia,

100 *parts of the Salt in its usual state contain,*

Insoluble matters, ...	1.20
Soluble in Alcohol Muriates, ...	0.75
Lime and Magnesia,...	Trace.
Muriate Soda, ...	2.45
Sulphate Soda, (dry), ...	80.00
Hygrometric water, ...	7.50
Water of crystallisation* and loss, ...	8.10
	100.0

Here, as before, the essential part of the analysis for Revenue purposes, is, that the Salt is really one containing about 80 per cent. of dry Sulphate of Soda, or dry Glauber's Salt.

II.—*Means of detecting the adulteration of Government Salt by the Phool-Kharee.*

The prompt, certain, and easy method of detecting this adulteration is the following one :—I set down here the mere rules, such as Native officers would, with a little teaching, quickly understand ; the chemical demonstration of them will follow in the next section.

* A small part of the sulphate of soda is in the state of crystallised salt, which contains 56 per cent. of water. The greater part of it, however, is in the anhydrous state.

The following is the necessary apparatus, all of which can be made or procured in the bazar:—

1. A glass tube about 0.5 inches in diameter, and 10 inches high, as in the marginal sketch. It is graduated to 25 divisions, on the principle shewn in the next section.

2. A common precipitating glass, containing about a quarter of a pint.

3. A pair of common medicine scales, with a single brass weight of 100 grains.

4. A bottle of solution of Acetate of Barytes, of the strength shewn in the next section.

5. A few straws, or a bone or ivory rod, for stirring the solution of the suspected salt.

To detect an adulteration.

A. Weigh 100 grains of any suspected Salt, and put it into the precipitating glass, fill the glass two-thirds full of clear water, and stir the salt till all has dissolved. A few grains will perhaps remain at the bottom, but these, which are sand and sulphate of lime, are of no consequence. Let the whole settle for a few minutes.

B. Fill your test tube from the bottle of Acetate of Barytes *exactly* to the upper mark.

C. Drop now, carefully, the liquid from your test tube into the solution of the salt. If there is any adulteration a heavy white cloud will be seen rolling quickly to the bottom. You must continue to drop in the solution till there is no more of this cloud; taking care that you allow it to settle from time to time, and not to put in *too much* of the test, particularly at the latter end of the operation.

D. The quantity of solution you have used, will be seen by looking at the tube. If it is 10, or 12, or 15, this is an adulteration of so much Kharee per cent. in your sample; and if it exceeds*—per cent. the Salt *must* have been purposely and illegally mixed with Kharee.

* This blank will be of course better filled up by you. It would be proper to make a set of trials with various Government salts before definitively settling it. It will never I think exceed 4 per cent., or at most 5.

E. Unless you want to know *exactly* the total amount of adulteration, which is rarely the case, you need only first drop in, say the 5 per cent. allowed by the Board, and after that 5 or 10 more. If it shews this, it is quite adulteration enough to prove that the salt has been purposely falsified, and there is no use in wasting your time and test liquor farther.

III.—*Chemical demonstration of the certainty of this method.*

1. It has been shewn that there are no Carbonates in the Kharee ; and the proportion of Sulphate of Magnesia is so small in good salt,* that for practical purposes, it may be neglected or allowed for. The Sulphate of Lime may also for practice be considered as wholly insoluble in cold water.

2. We have thus only to deal with the fraudulent admixture of the anhydrous Sulphate of Soda, and perhaps at times with a little Sulphate of Potass. The problem is therefore, really, reduced to the simple one of ascertaining the quantity of Sulphuric Acid in a given quantity of salt. We may always assume that the base is Soda. The working fact for revenue purposes is, that *no* Sulphuric Acid [which in saline compounds form the Sulphates] *can* be present in good salt beyond the per centage which we allow at page 942 without having been put there for fraudulent ends ; and in the state of Sulphate of Soda, *because* there is no other Sulphate available for so doing in the country.

3. We may take our specimen, containing 80 per cent. of the dry Sulphate of Soda, to be the strongest average salt used for adulteration. If a weaker sort, that is a Kharee containing more extraneous salts be used, more of it will be put into the parcel of salt to be adulterated.

4. If we take 100 parts of good salt to be adulterated with 25 per cent. of Kharee, it is clear that in this quantity there is $\frac{1}{4}$ of the 80 parts [or 20 parts] of the dry Sulphate of Soda which our analysis shews ; the remaining 5 parts being made up by the extraneous salts.

* It is only 0.45 in bazar salt by Dr. McClelland's recent paper. By my analysis of Madras salt and Cuttack Pungah salt made several years ago, it was 2.04 for the first, and 5.45 for the last, the mean of these would be 3.7 per cent. Mine was I think very fresh salt, taken from the heaps. As before noted, trials should be made before fixing a standard allowance.

These 20 parts of dry Sulphate of Soda contain 11.20 of Sulphuric Acid, which require 37.50 parts of Acetate of Barytes to precipitate them.

5. Now our solution of Acetate of Barytes is made by dissolving 100 grains of the salt in 1000 grains of pure water,* and the tube filled to the mark, containing exactly as much of the solution as is equal to 37.50 parts of Acetate of Barytes, the whole of its contents will thus precipitate the 20 parts of dry Sulphate of Soda, which the adulteration of 25 per cent. contains.

6. And, as it is marked with 25 divisions, each division will shew one per cent. of such an adulteration. As before remarked, a weaker Kharee would allow more adulteration, but as it would shew always a nearly equal quantity of the Sulphate, this may be taken for a standard. I do not believe that a much stronger Kharee could be prepared. Could it be so prepared as to contain 90 per cent. of the Sulphate, this would only make a difference of $2\frac{1}{2}$ on the scale in the whole per centage, and for practice nothing beyond proof of, say 10 per cent. of the Sulphate of Soda, is really wanted to be known.†

7. If we like to take our scale as representing the exact quantity of Sulphuric Acid (which will then be an *exact* index to the quantity of Sulphate of Soda) we must remember that the 37.50 parts of Acetate of Barytes contained in the tube, are divided by the graduation into 25 parts; and as this quantity of Acetate of Barytes is equivalent to [or will precipitate] 11.20 of Sulphuric Acid, we have thus 25 divisions for 11.20 of Sulphuric Acid. Every five divisions will then represent 2.24 [or $2\frac{1}{4}$] of Sulphuric Acid, so that we may say in practice, that every $2\frac{1}{2}$ divisions of the scale will shew about $\frac{1}{5}$th part of Sulphuric Acid, or nearly two of Sulphate of Soda: every five divisions representing exactly four parts of the pure Sulphate of Soda; and five of the adulteration, because of the extraneous salt and water.

* This solution, at the temperature of 84° is of sp. grav. 1.36, and the Acetate is preferred, because of its cheapness and facility of making it, and because if Muriates or Nitrates are to be sought for, it is not in the way. The Muriate or Nitrate of Barytes may of course be used if desirable, the tubes being graduated accordingly.

† Here, as before, I need not remark, that a set of careful trials should be made with the Phool-Kharee of various parts to fix a standard. This can only be properly done in the district.

IV.—*Estimate of the quantity of Puckwah produced annually.*

The Report to the Board estimates the annual produce of Puckwah at $1\frac{1}{4}$ lac of maunds. I presume this is a mere conjectural estimate, at least I have not learnt on what it is founded. The following data and estimate appear to me to have good chemical foundation.

1. Mr. Stephenson [Treatise on the manufacture of Saltpetre, and papers in Journal of Asiatic Society] says, that the average of Muriate Soda obtained by him from 20,000 maunds of *Dooah** or crude Saltpetre from Loll Gunge in Tirhoot at the Company's factories, which he superintended, were as follows :—

Average per cent. of Muriate of Soda from good *Dooah*, ...	4.2
From *Dooah* of native factories, ...	3.7
	7.9
Mean,...	3.95

and that only about 35 per cent. of this *Dooah* is Saltpetre. Hence we shall not, I think, exaggerate, if we say according to his results, (Pamphlet, page 47,) that in the average of factories, 2 maunds of *Dooah* (35 per cent. would require nearly 3 maunds) go to the production of one of Saltpetre. In round numbers we may also say, that as the average of good *Dooah* gives about 4 per cent. of Muriate of Soda,† there will be about 8 per cent. of it produced for every maund of good Saltpetre. But then, as we have seen by our analysis, there are but $\frac{3}{4}$ (75 per cent.) of *pure* Muriate of Soda in Puckwah, we must add the other fourth, or 2 per cent. to our 8 per cent. of Muriate of Soda to make it Puckwah. This gives 10 per cent. of Puckwah for 100 maunds of good merchantable Saltpetre.

2. But the preparation of the *Dooah* itself produces a large proportion of Puckwah, as I shall now shew.

3. Dr. Buchanan distinctly says, (Martin's Buchanan, vol. i. Behar, p. 363 and 364,) when describing the manufacture of *Dooah*, that he is assured that *as much* Muriate of Soda as Nitre is obtained by the workmen, and he gives at p. 364 and 365, the details of the manu-

* *Dooah* is in fact the first washings from the Saltpetre heaps or earths, boiled down and sold to refiners of Saltpetre, Natives or Europeans, who make it into marketable Saltpetre: all Saltpetre works must first produce *Dooah*.

† He speaks of some containing 8 per cent.

facture for making and refining the Nitre, with the products of it and of the Culinary Salt, 14 maunds of Saltpetre and 14 maunds of Puckwah. We shall afterwards see this singularly confirmed.

4. He again, in vol. ii. p. 280, when speaking of the manufacture of the Company's Nitre in Bhaugulpore, says, that "there is a concealed source of profit to the contractors," which he promises afterwards to mention, but he has not done so, or Mr. Martin's mutilated edition omits it. No doubt this is the production and sale of Puckwah; for,

5. In vol. iii. p. 332, (Puraniya,) he says, that when the Company's advances for Nitre were withdrawn, their monopoly rendering the private manufacturing of it illegal, the Beldars, 'Salt-makers,' betook themselves to the manufacture of Culinary Salt "from a saline earth found in many parts of the district." A small per centage would not have repaid them, and it is clear that it was no new trade to them as Saltpetre-makers.

6. Again, at p. 334, he says, that a Native agent of the Company assured him, and that some of the Beldars confessed, that they made *Beldari Nemuck*, (the same as the Puckwah,) from a thick brine called *Jarathi*, which subsides in making of their (crude) Saltpetre, which last is of course the same as the *Dooah.*

7. At p. 337, he relates the process for making the *Beldari Nemuck*, which is in fact *Puckwah.*

8. Dr. Buchanan, however, was evidently no chemist, and of questions like these only a chemist can understand the true bearings. Mr. Stephenson, who was a manufacturing chemist, and sent out by the Hon'ble Company, has left us still the best data. He says, p. 8, that he collected the saline soils from various part of Tirhoot to make an average; and he found by analysis that the Nitrates* formed 1.6 per cent. while the Muriate of Soda formed 1.4 per cent. Here we have a direct proof, though from another zillah, that Dr. Buchanan's apparently exaggerated statement, [p. 7,] that *as much* Culinary Salt as Saltpetre is made, may, in some parts at least, be no exaggeration!

9. Mr. Stephenson again shews us, by direct experiment, (Pamphlet, p. 84,) that in the making of *Cootiah* Saltpetre, or Saltpetre made from the earths preserved in factories, which is far richer in Nitre than that

* Of Potass and Lime, the first *is* Saltpetre, and the last becomes so as soon as it meets with potass, from ashes or vegetable remains, in the Saltpetre heaps.

produced in waste places, or on old walls, &c. the proportion of Puckwah to fine Saltpetre was 1 maund 16 seers to 14 maunds, or exactly 10 per cent. The proportion in earths collected as the *Nooneas*, (native Saltpetre-makers,) find them, was 7 seers of Puckwah to 22 of Saltpetre, or about 30 per cent. from the mother liquor only, after the making of the Saltpetre. From the whole result [p. 86] the proportion of Puckwah to Saltpetre was 17 seers to 55 seers, or about 33 per cent.*

10. I have not been able to meet with Dr. John Davy's experiments on the factory earths, or with Tennant's work,—if he had any thing on the subject? To Colebrooke I shall refer subsequently.

11. Resuming all these, we find, I think, that there is evidence enough to shew, that if *as much* Puckwah as Saltpetre be not produced, there must at any rate be a large per centage, and I think it cannot be below 30 per cent. for we find that Mr. Stephenson, doing his best, and under the most favorable circumstances—he did not want to produce Puckwah but Saltpetre—could not avoid obtaining 10 per cent. from factory earth of the best quality for Nitre, and 30 per cent. from others. Taking it, however, at only 25 per cent. in all the earths, of which as we have seen [page 7] 10 per cent. *certainly* exists, for it goes with the *Dooah* Saltpetre when sold to the refiner; we have still altogether 25 per cent. of Culinary Salt produced for every maund of good Saltpetre. I shall notice subsequently other sources of it.

12. We must now endeavour to ascertain the total amount of good Saltpetre manufactured in Bengal.

13. The total export of Culmee Saltpetre from Calcutta in 1840, was 4,86,000 maunds, and it has in recent years been as high as 5,14,000 maunds; for the sake of round numbers we may call the exports I think, 5,00,000 maunds.

14. We have next to estimate the internal consumption of Saltpetre for nearly all India, for it can but in few places be made so cheap as in Bengal.

* Again in Journal Asiatic Society, vol. ii. p. 23, he says, that an analysis from several hundred maunds of Native *Dooah* gave 8 per cent. Culinary Salt, (Muriate,) &c. to 77 Nitre. The proportion 8 to 77 is about 19¼ per cent. How much had been already extracted from it?

15. I find as a datum [the only one I can obtain,] that, by the return you have obliged me with, the mean importation of Saltpetre into Calcutta, before the abolition of the transit duties, from 1831 to 1835, or four years, was

Factory maunds, ... 4,51,446

But as we know how smuggling flourished in those days, even within the Custom House itself, we may I think fairly call the real imports bazar—instead of factory maunds.

Say then, imports, bazar maunds, ... 4,51,446

Average exports for the same period, from Custom House tables given by Stephenson, are bazar maunds, ... 4,25,683

The apparent consumption of Saltpetre for Calcutta, is thus bazar maunds, ... 25,763

Throwing away the odd hundreds, let us say 25,000 maunds for Calcutta, and this for such a circle of it and its environs as would include a population of a million. If our Bengal Saltpetre grounds and factories supply only as much of all India as includes a population of 50 millions, we have then 25,000 maunds to multiply by 50, or 12,50,000 maunds for the consumption of 50 millions of inhabitants; reducing this again to less than one-half, because of the more quiet habits of country villages, we may still say, that the home consumption equals the export; or that we have 5,00,000 bazar maunds, produced somewhere, for that purpose also.

14. This appears startling, but when we recollect the almost perpetual vollies of fireworks, small arms and cannons, which are kept up, in one place or other, all over the country, and every day in the year, and often night and day, and that all gunpowder contains 75 per cent. of Saltpetre, we shall not be so much surprised. Here is another calculation bearing upon this matter.

Buchanan in his statistical table states that, for Patna City and Zillah Behar, there are

Atusbaz, or firework-makers, ... 118

For the district of Bhaugulpore the same artificers, ... 44

Total, ... 162

Population (according to him) of Patna and Behar,... 33,64,420
Bhagulpore, ... 20,19,900

Total,... 5,384,320

In Rungpore he speaks of the gunpowder-makers, but not of the Atusbaz. I do not know if he means the same thing, and it is not unlikely in small places, that the two trades are exercised by the same person. In Calcutta I find they are sometimes mixed and sometimes separate. We must also recollect that, in India, great numbers of individuals as often make their own gunpowder as buy it. I leave then the mere gunpowder-makers out of the question, and look only at the fire-work-makers.

If we take the 162 artizans in this trade, to find employment each for 3 workmen at 5 Rupees, and the master to make 7 Rupees per month we have per month, ... *Rupees* 22
For 162 artists, this is per month, of profits,* 3,564
or 12 per annum profits, ... 42,768
If we take the *profits* to be 10 per cent. on the capital employed, this will be capital employed 4,27,680
If we take about three-fourths of this to be in Saltpetre, we may say for Saltpetre, ... 3,00,000
At 6 Rs. per maund, this is, ... *Maunds* 50,000

Now 50,000 maunds of Saltpetre annually, for a population of 5,384,000 would give, for one of 50 millions, about 4,62,000 maunds of Saltpetre, which, when we take all the home-made gunpowder and other manufacturing demands into consideration, is not so far from our former calculation. Patna, Behar, and Bhaugulpore comprise, I may observe, all varieties of population, from a great and luxurious city to the wild Hill tribes; and thus offer the elements of a fair average. Like all Indian statistical questions, the elements are so uncertain, that they are really but mere approximate notions, and I should not have occupied your time with it, were it not that the question of "what *is* the internal consumption of Saltpetre," is really an important one in our estimate. If we say that the 5,00,000 maunds of Saltpetre are worth at 6 rupees, 30,00,000 Rs., this would still not give an expenditure of one pice each in fire works for 50 millions of population.

* Wages must be paid out of profits.

16. We must then in the absence of better data than the foregoing take

The exports, at bazar maunds,	...	...	...	5,00,000
The consumption at least,... ...	...	...	...	5,00,000
Total amount of *refined* Saltpetre produced, *Baz. Mds.*				10,00,000
And in the production of this, there appears good chemical ground for assuming, that at least 25 per cent. of Puckwah are produced, which gives, from the Saltpetre manufactory alone, Puckwah to the amount of, *Baz. Mds.*				2,50,000

17. We have next to consider, that we may at least look at all the sources of the article, the different notices of the *Salt* works which are to be met with in various authors. This Salt we may also call Puckwah. They will scarcely afford us data, but they should not be passed over in attempting to estimate the quantity of Puckwah thrown into the market.

18. Mr. Colebrooke, (Remarks on Husbandry and Commerce of Bengal,) says, page 181, of London edition, that in Oude and Benares, this process of washing earth and evaporating the solution, is followed *to obtain Culinary Salt* without extracting the Nitre, and he details the process, but without any figured statements, as a perfectly familiar one. The proportion of edible Salt must be considerable, and the places where it is found numerous, to render it so well known an operation. Dr. Buchanan, vol. i. p. 550, speaks of the *Salt works* from wells in Ramghur, Zillah Shahabad.* In vol. iii. Dr. Buchanan, as before quoted, says, that the Beldars of Puranya made *Culinary* Salt alone, and he describes it as a separate manufacture at p. 337 and 338, the produce selling at 4 rupees per maund. Mr. Stephenson (Journal Asiatic Society, vol. iii. p. 36,) has a valuable paper on the manufacture of Salt in the Ghazeepore district, shewing that the earth contains *half as much* Muriate of Soda as Sulphate of Soda, *i. e.* 1.5. Muriate to 2.7 Sulphate, and that the Salt contains 60 per cent. Muriate of Soda or edible Salt to 37 per cent. of the Sulphate. We have no data by which to ascertain the extent to which this edible Salt manufactory is carried; we must therefore allow it as a

* Mr. Stephenson found the water of wells in Tirhoot to be strongly impregnated with Muriate of Soda.

make-weight in our former estimates of Puckwah. It will be seen in the succeeding section, that we may assume a considerable portion of Puckwah to be also produced in the manufacture of the Kharee, and possibly some in the preparation of the *Reher* or Soda earths, for the use of the washermen, soap-boilers, glass-makers, &c. &c.

V.—*Estimate of the quantity of edible Salt produced in the manufacture of the Phool-Kharee, and of the quantity of Phool-Kharee annually made.*

1. The production of the Salts called the Kars, Karees, and Dhars, is a separate trade where earths are washed for these alone, and they are also produced in the preparation of Saltpetre; we may suppose them not always thrown away when they form so large a per centage as it will be seen they do.

2. Dr. Buchanan says, vol. i. p. 366, that he estimates the production of Dhar at 2 maunds of it to every 14 maunds of crude Nitre. This is $\frac{1}{7}$th, or say $14\frac{1}{4}$ per cent. which as we allow 2 maunds of crude to make but one of refined Saltpetre, gives $28\frac{1}{2}$ per cent. upon every maund of this article.

3. Mr. Stephenson says, (p. 8), in his Analysis of the soil in Tirhoot, that it contains nearly as much of the Sulphate (Kharee) as of the Muriate and Nitrate together, but as we have before noticed (p. 8) the Culinary Salt obtained from these two sources, I only allude to them here. As a source of Kharee, they should be borne in mind. Mr. Stephenson says, 2.7 of Sulphate and 3.0 of Muriates and Nitrates. In Mr. Stephenson's paper, (Journal Asiatic Society, vol. iii.) on the efflorescence of the Kharee, we find the best datum. He says there, that the efflorescence collected by him gave 58 per cent. Sulphate, (Karee), and 22 of Muriate of Soda; so that, using round numbers, every maund of Kharee from thence would give the workman *one-third* of a maund of Puckwah. This, however, may have been a richer spot than the average. Buchanan says, that some Muriate of Soda is also found with the efflorescence of Carbonate of Soda, (*Rehar* or *Sajee Mutti*); but his work has evidently been sadly

mutilated in this part, and we have no data* to guide us in a calculation. Perhaps instead of 33 per cent., or one-third of a maund of Muriate of Soda to one of Kharee, we might assume with full safety 20 per cent. from this source? The low price of the Kharee, the best the report says, selling for 12 annas per maund, is strong presumptive evidence, that it is not the only product derived from the manufacture.

5. As to the quantity of Kharee produced, the report estimates the total of Kharees at $2\frac{1}{2}$ lacs of maunds. If our estimate, above taken, be correct, we have here 50,000 maunds of Culinary Salt from the Kharee. We may, however, make some attempt to estimate the quantity of Kharee produced. Dr. Buchanan says, as quoted p. 13, $14\frac{1}{4}$ per cent. on the rough Saltpetre. Mr. Stephenson gives 23 per cent. in one case, and $17\frac{1}{2}$ per cent. in another, of the Sulphate, but these proportions must be doubled, because 2 maunds of *Dooah* go to make one of good Saltpetre, which would then give 46 and 39 per cent. The mean of these three; viz.

Buchanan,...	$28\frac{1}{2}$	per cent.
Stephenson, ...	46	,, ,,
	39	,, ,,
	$113\frac{1}{2}$	,, ,,
Is, ...	38	per cent.

If we only take this at 25 per cent., which is a larger deduction than the near approach of Dr. Buchanan's estimate, by weight of manufacturing produce, and Mr. Stephenson's by chemical assay, would warrant, we should then obtain, if our estimate of the production of Saltpetre (p. 12) be correct, 25 per cent. upon 10,00,000 maunds of Saltpetre, or 250,000 of Kharee from this source alone; and as this must be of the purer sort, we cannot perhaps go far wrong if we suppose that the work of those *Nooneahs*, who make Kharee only, supplies the consumption of the cattle and the curriers. This is vague enough, but we have no better data. The report says, about 80,000 maunds of each of the three sorts may be produced in all, which would allow only 80,000 of

* This is an important question for research. "Is any Muriate of Soda extracted from the Soda earths?" If so, this may be also a very considerable source of illicit Salt.

the Phool-Kharee to be used for adulteration. I should be much more inclined to rate it at the lowest at double this quantity, or nearer 2 lacs of maunds of the first sort. We have already estimated the amount of Puckwah made with the Saltpetre alone, and we see that the amount of Kharee made with it must be very large. In the European refining factories it *appears*, (for we do not know all the secrets of the trade,) that the extraneous Salts are mostly thrown back to the Saltpetre heaps; yet with the large deductions I have made, and Dr. Buchanan for our authority, that the Nitre-makers *do* sell it, we shall not perhaps at all events exceed in saying that, every thing considered, at least a lac of maunds of Phool-Kharee may be thrown into the market for adulteration, and 25,000 maunds of Puckwah be produced in the making of Kharees of all kinds?

VI.—*Estimate of the loss to the Revenue from the foregoing sources.*

	Maunds.
Puckwah from manufacture of Saltpetre, ...	2,50,000
From Phool-Kharees, ...	50,000
Phool-Kharee sold for adulterations, ...	1,00,000
Total maunds, ...	4,00,000

This being all sold as Government Salt, gives

Total value at 400 rupees per 100 maunds, Co.'s Rs. 16,00,000

Of which loss to Government at 300 rupees, is Co.'s Rs. 12,00,000

VII.—*Concluding Remarks.*

This amount of loss to the Revenue seems enormous, but we may notice

1. That the nature of the Salt is a chemical certainty.

2. That we can attach the highest confidence to Mr. Stephenson's results, because he had no motives to wilful misrepresentation any way, and might fully expect his results and statements would be closely examined in Calcutta, so that his professional character as a chemist was at stake. I add, that from personal knowledge of him as a working chemist, I feel quite satisfied, that they *are* entitled to full confidence.

3. That even now our knowledge is evidently very imperfect, and the probability is, when we recollect that since our possession of these provinces Mr. Stephenson seems to be the only practical chemist who understood what he saw about him, that there are many more things for a chemist to discover.

4. I have, it will be observed, indicated some sources which can only be taken into account as make-weights; what may be the aggregate amount of all these we know not. It may be much larger than we suspect.

Postscript.

Fortunately I had not seen the report of the officer deputed to enquire on this subject before handing mine to you; and indeed I had but a few minutes' conversation with him before entering on the investigation, and the results of this conversation I have stated in my report. I say "fortunately," because it is most satisfactory to me, as it must be to the Board, and to him, that in so intricate and uncertain an investigation, two reports founded, the one upon local inquiry, and the other upon chemical and statistical deductions from a mixture of certain and uncertain data, the main results should so closely approximate. To shew how nearly they do so, and where they differ, I set down briefly in parallel columns, our results, following the order of my sections, and add my remarks at the end of each, where required.

Section I.—*Chemical constituents of the Salts.*

PUCKWAH.

Report says "Par. 38. Is informed that good Puckwah contains 10 Nitre, 53 Culinary Salt, 21 Kharee, Sulphate of Soda, &c. 16 various Salts."	I shew, that the sample analysed contains 75 Culinary Salt, no Nitre, $2\frac{1}{4}$ Kharee, and 15 extraneous Salts.
"Par. 60, contains Nitre."	

Note.—It is possible, and indeed most probable, that every sample differs, and in this the report agrees with me. But I should exceed-

ingly mistrust the information of any manufacturer, European or Native, on this subject, as see Par. 53, where it is said that the export of the Puckwah is kept secret as being illegal; see again p. 57. As there *must* be from 8 to 10 per cent. of water and insoluble matters in the Puckwah; this seems for a chemist a very rough note indeed. Next, what is meant by *good* Puckwah. Puckwah which sells well I suppose? for they could, I think, separate most of the 10 per cent. of Nitre and the Kharee with ease? I presume this mixture is that which best disguises the taste of the factitious Salt, or else that as mentioned farther, the factory servants had an interest in producing more Puckwah? Of the chemical constituents of the Kharee, the report says nothing.

Sections II. *and* III. have nothing in which we can compare, being wholly new.

Section IV.—*Estimate of the quantity of Puckwah produced annually.*

First from the Saltpetre manufacture in all its stages.

Report, "Par. 38. Very little Puckwah produced in the *refining* of Saltpetre, but afterwards, Par. 47, 6 per cent. occurs even with European superintendence, and the actual produce of it should be therefore reckoned from the *Dooah*. Par. 43. European factories *have* 6 to 8 per cent. Puckwah on their produce of *refined* Saltpetre."

"In a small factory Puckwah amounts to 10 per cent. on the refined Saltpetre."

"Par. 44. Four factories near Patna give 24, 30, 50, and 56 per cent. Puckwah!"

"Par. 45. *Nooneahs* allow that their produce amounts to about

I deduce that the produce is to be really calculated from the *Dooah* and in *its* preparation. That on the whole, with every allowance and deduction, it will not be excessive to say, that, for every maund of refined Saltpetre in the market, 25 per cent. or 10 seers may be allowed as the average production of Puckwah in making it. Thence it would appear, that it really must at least reach to this amount.

25 per cent. on their crude Nitre, [*Abee* or *Dooah.*"]

"Those of Behar and Shahabad may even obtain as much Salt as Saltpetre."

"Par. 49. And in northern Tirhoot, the name of Saltpetre is but a cloak for the making of Salt."

That there are in various parts *Salt* works, of which we have no notice; but I allow their produce as a make-weight.

V.—*Puckwah produced with the Kharee, and the quantity of Kharee.*

Report says, "Par. 61. The Phool-Kharee contains Puckwah."

"Par. 71. Puckwah made in N. E. Tirhoot."

"Quantity 1,83,000 maunds, but is now said to be [from the tax] 3,23,680 maunds, and 50,000 in Sarun of all sorts—Total 3,73,680 maunds."

I deduce that it certainly must be produced with it, to the extent of at least 25,000 maunds.

From Saltpetre and other data, 1,00,000 maunds Phool-Kharee will not be excessive, or 3 lacs of all sorts.

Section VI. *and* VII.—Little or nothing in common with the Report.

To conclude. The first object of my paper was to shew, that the adulteration might not only in the hands of a chemist be *detected* by very simple means, but that it might be *measured.* This measurement I see removes another of the difficulties before the Board, which is the detection of the adulteration of good Salt by Puckwah.

From the statement of the report to the Board, it seems that Puckwah also contains 21 per cent. of Kharee or Sulphates. In this case, the Puckwah is in fact but a mixture of Kharee and Puckwah; but taking our sample as a very pure one, a really *good* Puckwah, we see it contains $2\frac{1}{4}$ per cent. Kharee. Now, say the Government allows for chance impurities 4 per cent. of Sulphate, we may fairly take the medium between the 21 per cent. mentioned above, and our very pure sort as an average sort. This will be about 10 per cent. which is an amount distinct enough to be shewn to the clumsiest hand

by the use of the test, which thus becomes in all probability as good a one for the adulteration by Puckwah as for that practised by means of the Kharee.

Calcutta, 31*st October*, 1841.

Remarks by Captain J. T. Boileau, *Bengal Engineers*, F. R. S., F. R. H. S., *on the construction of Newman's improved Portable Barometer, and on the mode of renewing the Gauge Point when lost; with a Drawing.*

A recent modification has been made in the portable (or as it is more commonly called the mountain) Barometer, by Mr. Newman of Regent Street, London, whose standard Barometers have become so justly celebrated; and believing that a description of these instruments has not yet been published in India, I am induced to forward the accompanying sketch of their construction, and at the same time annex the result of some comparisons made with two of these portable instruments, and the Observatory standard, for the purpose of determining the gauge (or neutral) point of the latter, which had been lost in both by the escape of a considerable portion of mercury from their cisterns.

In the best portable Barometer of Troughton, Dollond, and Cary, the surface of the mercury in their cistern is brought by a simple mechanical contrivance to the level of a gauge point, (the Zero of the divided scale; by which the height of the column is read,) a measure of which if the gauge point were invariable, would do away with the necessity for a correction on account of the varying height of the mercury in the cistern, due to the rise and fall in the column.

The gauge point, or line, is not however invariable in either of the above constructions save Cary's; and Mr. Newman's object appears to have been to devise an instrument, which should be independent of the adjustment, preliminary and essential to each observation in those of the above kind, and whence the true height of the mercurial column should yet be deducible with as much accuracy, as if it had been read from the absolute Zero of the scale.

It is in the construction of its cistern that Newman's portable Barometer differs chiefly from others, and a description of this part, therefore, is all that is essential.

The cistern, (shewn in section in the figure) is of iron, and is divided into two chambers, A the superior, and B the inferior; communicating when in a given relative position with one another by a fine hole *o*, *o*.' passing through the bottom of the upper, and top of the lower chamber, the bearing surfaces of which are ground mercury-tight together; the lower chamber has motion round the common axis of the cistern through an arc of about 90°, so that by turning it a small quantity only, the connection between the two chambers is cut off, the continuity of the small hole being broken. Into the upper chamber the glass tube is inserted in the usual manner by means of a thick box-wood cap, which is pierced also to admit the stem of a small Thermometer, having its bulb immersed in the mercury of the cistern. A brass cylindrical case in two parts covers the cistern, each part being attached to its corresponding chamber. A hollow mahogany tube is attached by screws to the upper part of the brass case, and a brass scale of about 14 inches in length screwed to the wooden tube registers by means of a vernier reading to the 500th part of an inch, (and by estimation to the 1000th part) the height of the mercurial column.

The instrument having only a partial scale, and this not being directly referable to the surface of the mercury in the cistern, it is evident that to establish a correct Zero or neutral point, the capillarity of the tube must have been accurately determined beforehand; this done, a comparison is made with a standard instrument, and a point marked on the brass scale, (which is as yet undivided,) gives, after allowing for the difference in the capillary action of the two tubes, the Zero reading, or neutral point, of the portable Barometer.

An example will better explain this operation, upon the accuracy of which the correctness of the instrument depends.

Let the capillarity of the tube of the standard Barometer be +·002 inches, and that of the portable instrument +·037 inches, then if at the time of the comparison for determining the neutral point of the latter instrument, the mercurial column of the standard stood at 25.362 inches the corresponding height for the portable Barometer would be

$$25.362-(\cdot037-\cdot002)=25\cdot327 \text{ inches,}$$

which would be the Zero, or neutral, reading at the temperature of comparison; to and from this point the other divisions of the scale (inches, tenths, and half-tenths,) would be set off.

The neutral point being thus determined, the true height of the column of mercury above the level of the surface in the cistern for any other reading is deduced in the following manner:—

Let *a* ... ... *b* (see the section,) be the line of level corresponding to the neutral point, and suppose a fall to have taken place in the mercurial column, a proportional rise will take place in the level of the cistern, and the converse exactly for a rise in the column, which will be accompanied by a corresponding diminution in the level of the mercury below. The variations in height being inversely proportional to the areas of the occupied portion of the tube, and of the cistern; or, which is the same thing, inversely as the squares of their diameters, since, in Mr. Newman's portable instrument, both tube and cistern are cylindrical. If then, D represent the interior diameter of the cistern, and d,d′ respectively the interior and exterior diameters of the tube, all expressed in terms of the same linear unit; also if, h represent the height of the column at the neutral reading, and h′ any other observed reading, then the true height of the column H for that observed reading will be

$H = h' \times (h' - \overline{h'} \times \frac{d^2}{D^2 - d^2} \times 1$ at the temperature 1°— in which the upper sign is to be taken when the observed reading is greater, and the lower sign, when it is less than the neutral height. The factor $\frac{d^2}{D^2 - d^2} I'$ is constant for the same Barometer, and is what Mr. Newman calls, the *correction for capacity*—it is determined experimentally by the maker, and together with the neutral reading and temperature of comparison of the same, is stamped upon an ivory collar attached to the wooden case of each instrument.

It is much to be regretted, that the ingenuity and care displayed in the construction of the cistern of Newman's portable Barometer, (which is the same in principle as in his standard,) should be entirely thrown away by the exceedingly primitive and imperfect make of the other parts. For reduced, or indeed for good comparative observations, no Barometer is to be trusted, the scale of which is not divided on a brass or other metal rod extending the whole length of the instrument —but this, it has been seen, is not the case in that just described. There would be no difficulty, however, in fulfilling every desired requisite of the above nature in the construction of Newman's portable Baro-

meter, and thus improved, it would be found one of the most convenient, safe, and elegant instruments of its kind ever made, instead of being, as it now is, an almost useless toy.

In proof of this assertion, it is only necessary to mention, that both the portable Barometers brought out as a part of the equipment of the Simla Magnetic Observatory, were found to be quite unserviceable the very first time they were taken out for use; the mahogany tube was loose in the brass case of the cistern, and in one, (No. 44,) had warped, so as to have broken the Thermometer; in both, the boxwood cap, which attaches the glass tube to the cistern had shrunk, so that the mercury escaped in large quantities, and the neutral point being thus lost, the Barometer was of course, in its present state, useless for absolute measurements; but having no other instruments, it became an object of importance to repair, if possible, those in my possession, and to institute a gauge point or neutral reading for them by comparison with the standard in the Observatory, and I am induced to forward an account of the method in which this has been effected more *pour encourager les autres*, who may be left to their own resources as I have been, not to set aside even an imperfect instrument without an effort to improve its condition: for the result of my own attempt has certainly proved as successful as, under the circumstances, could have been expected. It is of the first importance too, in the publication of altitudes determined by the Barometer, that the quality of the instrument employed should be known, and as the two portable Barometers in my possession will be used frequently for determining the relative heights of mountains by simultaneous comparisons with the standard in the fixed Observatory, the following details are the more necessary, as shewing what weight may be attached to the observations made with them.

The first thing necessary was to make the cistern perfectly mercury-tight, which has been completely effected by a stuffing of tow and glue round the boxwood cap, the cap having been filed to a level (inwards) sufficiently to allow of a wrapper of the above materials being applied and pressed down by an iron tool from above—next, the instrument being inverted, a hole *(e f)* bored in the lower chamber and a fine screw tapped into it; a supply of mercury was then introduced, and the cistern being screwed up, the instrument was set by to dry for some days, after which, the comparisons for determining the neutral reading were commenced.

The standard Barometer of the Observatory, with which the comparisons were made, is by Newman, the cistern measures 6 inches in height and three in diameter over all, and about $2\frac{1}{2}$ inches inside, the tube is 5.54 inches in diameter *inside*, and the scale and vernier are of platinum, the former being attached to a brass rod terminating below in a fine ivory point, which is adjusted to the surface of the mercury in the cistern—the scale reads by means of the vernier to the 500th, and by estimation to the 1000th part of an inch, to which limit all the observations are taken.

The following are the values given by Mr. Newman of correction for capacity, &c. of the two portable Barometers attached to this Observatory:—

No. 40—Correction for capacity, ...	$\frac{1}{42}$
For capillary action, ...	+·042
Temperature, ...	60° Faht.
No. 44—Correction for capacity, ...	$\frac{1}{55}$
For capillary action, ...	+·031
Temperature, ...	60° Faht.

The Thermometer of No. 44 is broken.

The comparisons were made in the following manner: the two portable instruments were hung up on the same pillar with, and one on each side of, the standard Barometer, and a small excess of mercury having been introduced into the cistern, the escape of a portion was allowed to take place by means of the screw below until the height of the column read approximately the same as the standard, making due allowance for the difference in the capillary action of the two tubes; a perfect coincidence was found impracticable.

The annexed table exhibits the mean daily results of the comparisons which were taken, every two hours at the times appointed for the other regular observations, and embrace therefore the period, nearly, of one complete oscillation; viz. from 10h. 29m. A. M. to 10h. 29m. P. M. inclusive, Observatory mean solar-time, so that each entry is the mean of seven observations, and the mean of the means for No. 40 is deduced from 133, and for No. 44 from 112 comparisons; the differences from the standard are as accordant as could have been expected, considering the imperfect nature of the scale upon which the heights are measured, the difficulty of getting a good contact with the surface

of the mercurial column, and that the daily means combine the errors or *personal equations* of the different observers. It is perhaps superfluous to mention, that the first comparative reading of each portable Barometer has been taken as a Zero, to which all the corrections for capacity have been made, and if the instrument could be read with precision, all the differences from the standard should have come out alike. The differences of the partial results from the final mean are, however, generally within the limits of the probable error of observation, and the latter may therefore be considered as correct an approximation as could, under the circumstances of the comparison, be obtained, and certainly sufficiently so to warrant the use of the instrument in the determination of altitudes, comparatively with the Observatory standard, to which, provided the cisterns remain mercury-tight, they will now be immediately applied. The results of those observations will be communicated hereafter.

Table of the mean daily comparisons of Portable Barometers, Nos. 40 *and* 44, *with the Observatory standard, No.* 40.

Days.	Standard.		Portable Barometer No. 40.						Portable Barometer No. 44.					
	Height of Column +·003.	Therm.	Height of Column +·042.	Therm.	Diff. from first reading.	Correction for capacity 1·42.	Corrected reading.	Diff. from standard.	Height of Column +·031.	Therm.	Diff. from first reading.	Correction for capacity 1·55.	Corrected reading.	Diff. from standard.
0	23·336	0	23·306	0	0	0	0	−·030	23·343		0	0	0	+·007
1	23·315	61·6	23 271	61 9	−·037	−·009	23·260	−·052	23·324		−·010	−·004	23·320	+·004
2	·357	62·	·316	62·1	+·010	+·002	·318	−·041	·365		+·022	+·004	·369	+·012
3	·333	62·1	2·89	62·3	−·017	−·004	·285	−·048	·335		−·008	−·002	·335	+·000
4	·339	62·6	·300	63·0	−·006	−·001	·299	−·035	·346		+·003	+·001	·347	+·006
5	·308	61·7	·272	62 0	−·034	−·008	·264	−·044	·316		−·027	−·005	·311	+·003
6	·261	61·3	·220	61·5	−·086	−.027	·193	−·068	·264		−·079	−·014	·250	−·011
7	·285	60·7	·232	61·3	−·074	−·018	·214	−·071	·289		−·054	−·010	·279	−·006
8	·394	60·1	·348	60·5	+·042	+·010	358	−·046	·396		+·053	+·010	·406	+·014
9	·404	60·	·354	60·2	+·048	+·012	·366	−·028	·407		+·064	+·012	·419	+·015
10	·386	59·7	·347	60·1	+·041	+·010	·357	−·029	·394		+·051	+·010	·404	+·018
11	·386	58·9	·348	58·7	+·042	+·010	·358	−·029	·398		+·055	+·010	·408	+·022
12	·429	57·3	·380	57·0	+·074	+·018	·398	−·031	·432		+·089	+·016	·448	+·019
13	·399	56·9	·353	56·5	+·047	+·011	·364	−·035	·412		+·069	+·013	·425	+·026
14	·354	57·3	·306	57·1	+·000	+·000	·306	−·048	·364		−·021	+·004	·368	+·014
15	·408	58·	·362	57·7	+·056	+·013	·375	−·033	·418		+·075	+·014	·432	+·024
16	·388	58·7	·335	58·2	+·029	+·007	·342	−·046	·394		+·051	+·010	·404	+·016
17	·346	59·4	·296	59·1	−·010	−·002	·294	−·052						
18	·320	59·4	·280	59·3	−·026	−·006	·274	−·046						
19	·362	59·2	·318	59·3	+·012	+·003	·321	−·041						*
mean	23·356	59·8	23·312	59·9	+·006	+·001	23·313	−·043	23·366		+·026	+·004	23·370	+·011

Magnetic Observatory, Simlah, 5th Nov. 1841.

* This difference is taken from the mean of the standard for 16 days, viz. 23.359 inches.

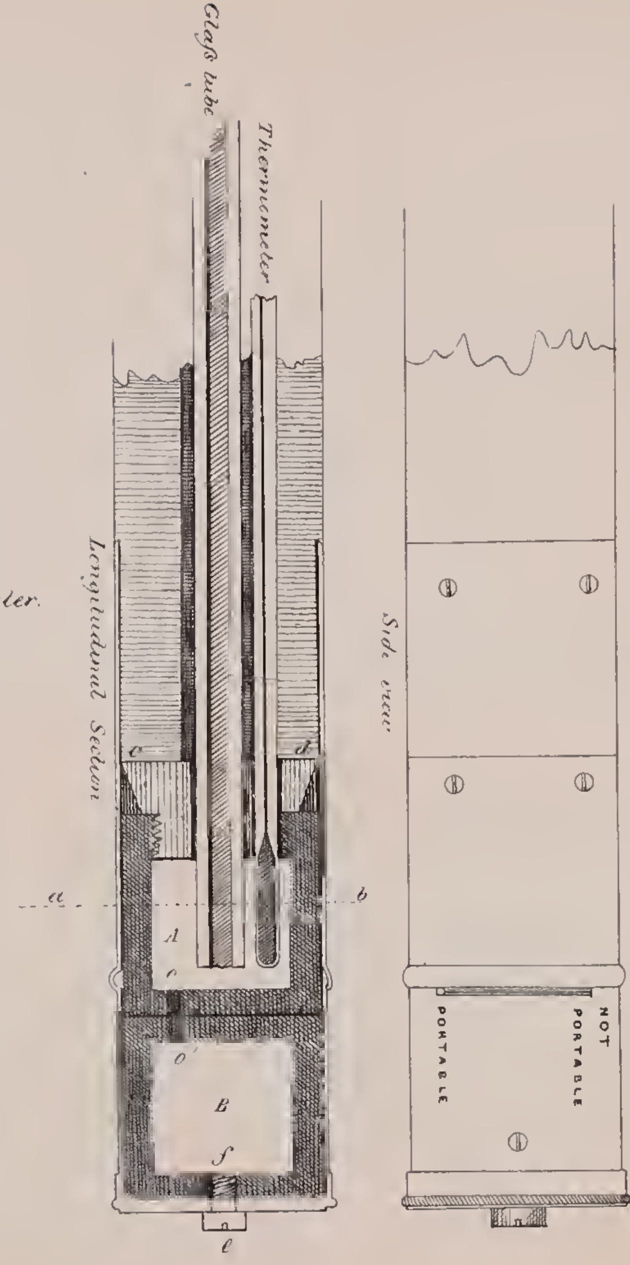
Side view

and Longitudinal Section

of the Cistern of

Newman's Portable Barometer.

Full Size.



T. Black, Asiatic Lith. Press Cal.

It appears from the above, that the mean neutral reading for Portable Barometer, No. 40, viz. 23·313 is .043 of an inch too low, and in No. 44, the neutral reading 23·370 is ·011 of an inch too high. The following Examples will explain the method of reducing the observed to the true readings for both instruments:—

Example for Barometer, No. 40.

Suppose the observed reading on the scale to be 22·543 inches, the temperature of the mercury being 49° Faht.—the true height of the column is required.

Observed reading, ...	h'	=	22'·543 inches.
Neutral do.	h	=	23·313
Difference, ...	$(h'-h)$	=	−0·770
Correction for capacity, ...	$\frac{1}{42}(h'-h)$	=	−0·183
Observed reading as above, ...	h'	=	22·543
True height of column, ...H.	$= h' - \frac{1}{42}(h'-h)$	=	22·360 inches.

Example for Barometer, No. 44.

Required the true height of the column of mercury, the observed reading on the scale being 25·291 inches and the temperature of the mercury, 64° Faht.

Observed reading,.....	h'	=	25·291 inches
Neutral ditto, ...	$h.$	=	28·370
Difference, ...	$(h'-h)$	=	+1·921
Correction for capacity, ...	$\frac{1}{55}(h'-h)$	=	−·349
Observed reading as above, ... ——	h'	=	25·291
True height of column, ...H.	$= h' + \frac{1}{55}(h'-h)$	=	25·640

A correction would also be required for temperature, but with instruments of this construction, *i. e.* as to relates to their scale, the reduction in this account is impracticable.

Observations of Meteors, on the night between the 12*th and* 13*th November* 1841, *made at the Magnetic Observatory at Simla. Communicated by Captain* J. T. Boileau, *Engineers, F. R. S. &c. &c. Superintendent.*

The observed recurrence of numerous meteors on the same night, during a series of years, having led to a belief in their periodicity; it has been become a special duty at all the fixed Magnetic Observatories to watch for their appearance, on the dates in question; the nights of the 10th August, and of the 12th November, have afforded the most remarkable instances of their recurrence, both as regards their number, and the regularity of the phœnomenon. Our labours here, on the former night, were fruitless — not a single meteor having been visible; but the following account of those observed on the night between the 12th and 13th instant, confirms the fact, as regards the latter date. It is to be hoped, should similar observations of these meteors have been made in other parts of India, that an account of their appearance may be forwarded for publication, in the Journal of the Asiatic Society, *without delay.*

Night between the 12*th and* 13*th November*, 1841. *By* 3*rd Assistant* C. Nuttall.

8: 15 P. M.—Brilliant meteors, to N. Motion moderate, direction from near the Pole-star perpendicularly downwards.

11: 10 P. M.—Meteor NE. by N. altitude 1st appearance 30°, direction downwards.

11: 15 P. M.—Meteor over head, direction downwards.

By 1*st Assistant* J. B. Grisenthwaite.

2: 55 A. M.—A few luminous patches appeared from E. to N.E. at an elevation of about 30°. At 3h. 02m. A. M. they became more brilliant, and light was apparently pulsating through them; at 3h. 08m. assuming a dull appearance, they disappeared.

3: 30 A. M.—Two dim meteors from Zenith downwards, direction N.E.

4 : 25 A. M.—Five bright meteors passed rapidly from Zenith vertically downwards, N.E.

By 2d Assistant W. CRAIG.

On proceeding to the Observatory about 4 : 25 A. M. perceived a shower of meteors, and after taking the regular observations, recorded meteors as follows; viz.

1. From Zenith downwards, S.
1. Ditto ditto S. altitude of first appearance, 50°.
1. Ditto ditto E. ditto ditto, 40°.
1. From E. nearly horizontal to S.E. ,,
1. From N.E., direction E., altitude of 1st appearance, 50°.
1. From Zenith towards E.
1. From ditto, direction downwards to S.W.

The 2d Assistant observed in all about 30 meteors, chiefly in the above directions, but did not record them individually.

By Captain J. T. BOILEAU, *Engineers, Superintendent, at Strawberry-Bank, about* 800 *yards E. of the Observatory.*

4 : 50 A. M.—1. From α Hydræ, S.S.E. vertically downwards.
4 : 55 A. M.—1. Through Corvus ditto ditto.
5 : 03 A. M.—1. Between γ and λ Argus, small, ditto.
5 : 05 A. M.—1. Through middle of Auriga, N.E. to S.W.
5 : 06 A. M.—1. From near α Leonis downwards E.
5 : 08 A. M.—In Argus as above, vertically downwards.
5 : 11 A. M.—1. From near Procyon S. vertically down.
5 : 13 A. M.—1. Near γ Columbæ, S. downwards.
5 : 25 A. M.—1. Very small from α Leonis towards S.E.
5 : 26 A. M.—1. Between α and β Cassiopeæ downwards N.N.E.
5 : 32 A. M.—1. Very rapid from Cancer through Gemini and past β Persei.
5 : 41 A. M.—1. Very faint from near Sirius downwards W.S.W.
5 : 45 A. M.—1. Faint downwards N.N.E. from between ξ and η Ursæ Majoris.

Day-light interrupted further observation, though faint lines were occasionally observed as of the passage of meteors, for sometime after the day had well dawned. The night was remarkably clear, free from clouds, and calm, and stars were particularly bright:—one meteor only was observed on the evening of the 13th November, and none had been seen for many nights before the 12th.

During the time of the luminous appearance observed in the N.E. mentioned above, the underwritten readings of the Declination Magnetometer, were taken. The scale readings of the instrument had been gradually increasing for nearly an hour previous to the phenomenon noted, and at the moment of its occurrence, a gradual decrease began to take place, and continued until the disappearance of the patches.

At 2 : 45	A. M.	Scale reading of Declination Magnetometer,	156.
3 : 00	Ditto,	ditto,	155.9
3 : 15	Ditto,	ditto,	155.8
3 : 30	Ditto,	ditto,	155.4
3 : 45	Ditto,	ditto,	154.7
4 : 00	Ditto,	ditto,	154.2

The two latter readings being lower than any observed at these times of the day, during the month. The change of reading indicates a movement of the north end of the declination needle, West, through an arc, not taking the torsion of the suspension thread into account, of 1′ : 13″—the arc value of the scale being .676′ for each division. The horizontal and vertical Force Instruments remained steady during the above period.

On Porcelain Clay found at Mangalore. By A. T. Christie, Esq. *Madras Medical Service. Communicated by Government.*

In compliance with the instructions of the Honourable the Court of Directors, conveyed to me in a letter from their Secretary, before I left England, to report proceedings to the Government of Fort St. George, I have now the honor to furnish an outline of my researches since my arrival in this presidency.

In proceeding from Mangalore by way of Cannanore, Tellicherry, and through Wynaad to the Neilgherry Hills, I had an opportunity of examining the geological structure of the country along that line of road.

The country on the coast, and probably extending to the foot of the Ghauts, consists entirely of the ferruginous claystone formation, which has been described by Buchanan, under the name of laterite. It rests upon granite and gneiss, which make their appearance in the beds of many of the rivers, and very frequently on the sea coast. The laterite is of little importance in an economical point of view, except as a building stone; but is interesting when studied in relation to the phenomena of springs, the nature of soils, and its general effects upon vegetation, to all of which subjects I propose hereafter to devote my attention. As far as I had an opportunity of examining the other formations, they appear to yield no mineral products of any value.

A few miles to the north of Mangalore, and in connection with the laterite, I discovered an extensive deposit of pure porcelain clay, very closely resembling that of Limoges in France, of which the beautiful Sevres-ware is formed. I need not point out the importance of this article. Being found close upon the coast, it might be easily shipped, and sent home as dead weight, or with the assistance of Chinese workmen, it may hereafter become an article of manufacture in India. I also found it in considerable abundance, and nearly of equal purity on the Neilgherries.

The whole of Wynaad consists of primitive rocks, with a few patches of laterite in certain situations, and great deposits of diluvium. In the latter (which consists principally) of a reddish clay, with imbedded fragments of gneiss, granite, and quartz, gold is found. On the road between Nellival and Goodaloor, I observed some shal-

low pits in the diluvium, and remarking the similarity between this deposit, and those in which gold is found in other parts of the world, I made enquiries of the natives respecting it, and ascertained that they procured gold here by washing in the rainy season. Having seen no geological account of the gold works in this part of India, I am not aware whether this metal has yet been found in its original matrix, or whether it is wholly derived from this loose transported deposit, or diluvium, as geologists call it. The latter forms a succession of low rounded hills, which are intersected by streams, and are every year partially worn down by the rains, which is perhaps the origin of the river gold of these districts.

The Neilgherry hills are entirely composed of primitive rocks, consisting principally of granite, gneiss, a large quantity of earthy felspar, quartz, and a peculiar rock, which I would name corundum rock, from its having that mineral as one of its principal ingredients. I have met with nothing analogous to it in Europe, and it occurs in great abundance ; many of the hills being entirely composed of it.

Some interesting questions connected with the parallelism and elevation of strata, and other branches of theoretical geology may derive elucidation from a more minute survey of the Neilgherries, and the neighbouring country ; but as these are not suited to a report of this nature, I must reserve them for the memoirs I hope to be enabled to publish at some future period on the geology of India.

The climate and agricultural features of the Neilgherries are more interesting and more worthy of attention than their geology. These hills, rising in the middle of the torrid zone, to the height of nearly 9,000 feet, present every variety of climate, from that of the plains of India to that of England. The climate of their higher parts resembles that of the great intertropical cities of South America,* which have become the centres of civilization in the new world ; but is superior in one point of view, being never subject to those sudden changes and cold piercing winds, which are occasioned by the vicinity of lofty mountains, some of which are capped with snow. The mean temperature of Ootacamund is rather more than that of London,

* Quito is about 9,000 feet above the level of the sea; Santa Fe de Bogota, 8,000 feet; Mexico about 7,400; and Caraccas nearly 3,000 feet. Although the latter place has been called an earthly paradise, its climate is changeable and unhealthy.

but its annual range of temperature is very small, and it may be said, that the season of spring reigns throughout the year; yet, though there be no winter, the heat is never sufficiently great to bring the more delicate Europe fruits to perfection, and at this height we can only expect the successful cultivation of corn and of vegetables. The valleys, which have a height of from five to six thousand feet, enjoy the climate of Italy, the climate of the vine, the olive, the orange, and the mulberry. The tea tree is cultivated in China between the latitudes of 27° and 31° in a hilly country, and consequently in a climate probably of 70° to 73° of mean temperature. Such is nearly the mean temperature of the valleys in the neighbourhood of Kotagherry, and of many others along the Eastern and Northern faces of the hills. The cultivation of this valuable plant might therefore be attempted here, and with a much better chance of success, than in almost any country beyond the limits of China. A little lower down than this, coffee might be produced; its native habitation being on the sides of the lofty mountains of Yemen, and nearly in the same latitude as the Neilgherries.

But with all these advantages of climate, there are certain peculiarities, which in some situations prove most injurious to vegetation, and if overlooked in any schemes for the improvement of agriculture or horticulture in these regions, might mar our best exertions. These are; 1st, the great intensity of the solar rays when the sky is not obscured by clouds; 2d, the great waste of heat from the ground and from plants by radiation in clear nights. The former will sometimes produce a heat of from 90° to 100° on the surface of leaves, flowers, and fruit during the day; the latter may subject them, in the succeeding night, to a degree of cold considerably below the freezing point. Few plants will bear so great a transition, and it is only to be avoided by a judicious selection of situations, which are not likely to be much under the influence of the two causes I have noticed; or in the case of fruit trees, and garden plants, by matting and other contrivances. I need scarcely remark, that it would be highly desirable to ascertain the meteorological characters of the different parts of the hills, before attempting the introduction of any new staples; otherwise, in a new country, and without experience, success would be very questionable, and would rest only upon blind chance.

Next to the climate of a country, the most important object an agriculturist has to turn his attention to, is the nature of the soils. One of the most remarkable features of the Neilgherries is, the great depth of soil met with, even on the highest hills. It has originated principally from the disintegration of the earthy felspar mentioned above, which is more or less mixed with sand, is coloured with iron, and in some situations, contains numerous pebbles and small fragments of quartz, and of the other subjacent rocks. In some valleys, it contains a certain quantity of vegetable matter; and in many places on the higher hills, a thick coat of black vegetable stuff is found principally formed of decayed ferns, and which might perhaps be usefully employed for the amelioration of other soils. The ground is, in general, easily worked, but being (as far as I can at present judge) entirely deficient of lime and of every description of salt, it will probably, for certain kinds of cultivation, require to be highly manured, either with lime, with salts, or with vegetable and animal composts. Lime is clearly indicated as a manure for the Neilgherry soils; but the very circumstance which renders it so necessary; viz. its total absence among the subjacent rocks, makes it difficult to be procured. The lime which is employed in building is obtained from the kunker, (calcareous tufa,) which occurs in great abundance all over the plains of Coimbatore; upon analizing it, however I have found it to contain a considerable quantity of magnesia, which renders it totally unfit for the purposes of agriculture, nothing being so injurious to vegetation as that earth. Were the distance, not too great, shells might be brought from the coast to improve the soil, and sea salt, and nitre, neither of which are very expensive, might prove useful.

I need not insist on the inducements that these, and some of the other hills further South* hold out to English enterprise; since the government have already by their many liberal and enlightened measures for their improvement, shewn themselves perfectly confident of the immense advantages that must hereafter be derived from them. I am led to hope, therefore, that I shall only meet the wishes of the government, when I humbly beg leave to suggest, that I may be permitted to devote part of my time to a more minute survey of them, so as

* The Pyney and Vunhogerry mountains, which have probably an elevation of from 5,000 to 7,000 feet above the sea.

to enable me to exhibit an accurate exposition of every thing connected with their physical geography, such as the height of their principal summits, the general height, form, and direction of their valleys, the climate of their different parts, the characters, and composition of their soils, the nature of their springs and streams, their vegetation, and their geology. With this view, I could establish my head quarters on the Neilgherries; for under any circumstances, it will be necessary for me to have a fixed residence, where I may leave my books, apparatus, and specimens; and as long as I continue in the South of India, the situation of these hills will be sufficiently centrical for this purpose.

After having remained several weeks on the Neilgherries, I came to Madras by way of Trichinopoly and the coast, in expectation of finding some secondary formations near the former place. In this, however, I was disappointed, and found that part of the country to possess but little geological interest. On the coast I was more fortunate, having discovered several curious deposits containing fossils, which are calculated to throw some light on the geological epochs of the Indian formations.

Since my arrival in India, I have made considerable collections in Zoology, and have procured some very interesting specimens of fresh water-fish, crustacea, and insects. These it will be impossible for me to describe, while engaged with my various researches in India. My time while in this country, must be chiefly occupied with collecting materials, which can be only arranged and described on my return to Europe.

Descriptions of three Indian species of Bat, of the genus Taphozous. By Edward Blyth, *Curator to the Asiatic Society.*

Of the several well-defined generic forms presented by the Insectivorous Bats, a perfectly distinct one exists in the *Taphozous* of the Chevalier Geoffroy St. Hilaire, or *Saccopteryx* of M. Illiger, which was founded by the former eminent naturalist upon a species discovered by him in the catacombs of Egypt, and which he has figured and described, in the great national French work on that country, by the appellation

T. perforatus; a second African species is considered by him to exist in the *Doret Volant* of Danberton, styled *T. Senegaliasis* by M. Geoffroy; and a third has been discovered in Abyssinia by Dr. Ruppell, who names it *T. nudiventer;* a fourth is described by M. Geoffroy; *T. Mauritianus;* and the *Vespertilio lepturus* of Schreber, or *V. marsupialis* of Müller, said to have been brought from Surinam (which is very doubtful, as the form would otherwise appear to be peculiar to the warm regions of the Old World), and which species (according to Mr. Gray) "scarcely appears to differ" from that first noticed, is recognized as *T. lepturus* by M. Geoffroy, and as *Saccopteryx lepturus,* by M. Illiger. Another alleged American species is the *T. rufus* of Dr. Harlan, founded on the Bat figured in Wilson's American Ornithology, on the same plate with the American Eagle owl; but a glance at this figure is quite enough to shew that the animal belongs to a widely different genus of Bats, and it is supposed by Mr. Gray to be not improbably the *Vespertilio pruinosus* of the late accomplished American naturalist, Mr. Say, which Mr. Gray refers to *Scotophilus* of Dr. Leach, (synonymous with *Nycticejus* of M. Raffinestque). The *Taphien filet* figured in the work on Egypt, is the type of the distinct genus *Rhinopoma,* and is stated to have been termed a "Taphien" on the plate by mistake. The only Indian species which has yet been described, to my knowledge, is the *T. longimanus* of the late indefatigable Major General Hardwicke, of which a description and plate are given in the fourteenth volume of the Linnæan Transactions, (p. 525). This is mentioned as being "common in Calcutta, in dark store-rooms; at night it frequents habitations, attracted by the light of the candles and numerous insects." Finally, in the valuable "Catalogue of Mammalia inhabiting the Southern Mahratta country," published in the Madras Journal of Literature and Science (Nos. 24 and 25), by Walter Elliot, Esq., we are informed that "only one specimen of *Taphozous* was obtained, of which the description has been lost." (p. 99.)

The members of this group are distinguished by a conically-shaped head, flattened on the face, and having a large and deep circular concavity between the eyes; the nostrils are small and terminal, approximated, and capable of closure at the will of the animal; the ears are widely separated, somewhat triangular, and broad at base, a fold of skin being continued from the base of their upper and fore margin to the border of the

frontal depression above the eye, and another forwards from the lower margin, which is furnished with a lobe corresponding to the "drop" of the human ear, only it is not pendent, and the base of it is even with the mouth; the conch usually lies flatly outwards, the anterior margins of the two ears forming a straight transverse line, and their medial part collapses into plaits, which are obliquely transverse with the tip, as is more particularly noticeable in the living animal; within the conch is a short hatchet-shaped tragus, nearly as broad again at the extremity as at the base. The wings in this genus are long and rather narrow, the short thumbs being furnished at base with a small and slightly flattened cartilaginous cushion, which is more or less observable in other Bats, and is only more developed in certain *Dysopodes*, or (according to Mr. Gray) the young of these, supplying the trivial character upon which Spix founded his subdivision *Thyroptera:* the innermost digit is connected at base to part of the fore-arm by a small internal membrane, forming a little sac, whence the name *Saccopteryx* of M. Illiger. The tail of these Bats is more or less elongated, and is enveloped at base in the interfemoral membrane, from the upper surface of which, about half way from its margin, the extremity protrudes in proportion as the membrane collapses, to a variable extent (apparently) in different species, curling round backwards and upwards in the altitude of repose, and becoming sheathed as the membrane is expanded. Another curious character, more or less developed in the different species, and chiefly in the males, consists in a large gular sac, the orifice of which is anterior and transverse; on the chin are two slight, parallel, and nearly contiguous, longitudinal folds of the skin (which in certain species, are rudimental), each subdividing into two smaller folds posteriorly, the channels between which lead to the sides of the throat-sinus; the interior of the latter would appear to be glandulous, though I have been able to perceive no trace of secretion. On the middle of the upper lip is a slight duplicature; and the top of the lower lip is conspicuously reflected, having a mesial groove; the mouth is cleft to beneath the forepart of the eye. These animals, according to Cuvier, have one pair of upper incisors, though often none, and the latter is the case with five specimens before me, appertaining to three species; they are probably pushed out by the growth of the permanent canines (as in various other Bats), which of course follows after some time the renewal of the properly decsiduary, or "milk"

incisors, and therefore may be of some utility for a time, co-existing with the first canines, but no longer required when these are supplanted; in the lower jaw are four distinctly trilobated incisors: behind the upper canines are one or two very minute false molars, then a large sharp pointed one, corresponding to the *carnassier* or "scissor-tooth," and posterior to this are two large subquadrangular true molars, less elevated than the last, and succeeded by a small transverse third true molar; below are two large pointed false molars, and two large and one small true molar, corresponding to those above. The fur is soft, close, and velvety, and in most species plentiful, being generally, if not always, slightly grizzled towards the extremity of the pile.

The first species I have to notice is the

T. longimanus, (?) Hardwicke: but as the details furnished by that observer are, for the most part, of generic rather than specific import, it may prove to be an allied one, though I do not think this probable. The only specimen I have seen is an adult male, for which I am indebted to my valued friend, and former European acquaintance, Dr. Cantor, in whose residence in Calcutta it was captured. The description and figure are taken from the recent animal.

Length, from nostrils to end of tail, $4\frac{3}{8}$ inches, the membrane extending $\frac{7}{8}$ inch further; alar expanse 16 inches; tail 1 inch, capable of protrusion $\frac{3}{4}$ inch, and of being sheathed for its whole length; ears, posteriorly $\frac{5}{8}$ inch, or anteriorly to inferior lobe even with the mouth, above $\frac{7}{8}$ inch, their breadth at base $\frac{5}{8}$ inch, and tips apart as they lie flatly outwards, $1\frac{3}{4}$ inch; tragus $\frac{3}{16}$ inch, and of the usual hatchet-shape, widest at the extremity. Length of fore-arm $2\frac{5}{8}$ inches, and from wrist to end of wing above $3\frac{7}{8}$ inches; tibia 1 inch, and foot minus the claws, $\frac{1}{2}$ inch; two small longitudinal excrescences on the chin, but no throat-sac in the specimen, though the site of this is indicated by a semi-nude rudiment of the structure in question. Colour of the fur uniform dark fuscous-brown above, slightly tipped with a lighter colour, and pure white at base; beneath paler, except on the throat, from being more conspicuously tipped with brownish-grey; the fur everywhere very close and full, rather short, and soft, and velvety; face almost nude, and with the membranes darker than the back; the ears, as usual, naked externally, except at their posterior base, and on a fold near this; within are a few minute hairs.

General Hardwicke's animal is stated to have measured "$\frac{9}{10}$ inch between the ears," though it is difficult to understand where he fixed the boundary of their bases; but raising the ears, for they naturally lie flatly outwards, (as in the *Rhinopomata* and *Dysopodes*,) the distance between those of my specimen scarcely exceeds $\frac{1}{2}$ inch, and as General Hardwicke's Bat was only "5 inches long, and $14\frac{1}{2}$ inches in extent of wing," I doubt whether a greater interspace existed between its ears than in the subject before me, notwithstanding the figure given, which has doubtless passed through the ordeal of a native artist, in addition to that of the engraver. "The body," he says, "is thickly covered with a very soft hair, in the adult of a snuff brown; the legs, wings, and membranes black: but the full-sized young are of a deep black on all parts." To this I will add, from his Latin quasi definition of the species, "supra ex fusco rufescens, subtus pallidior," and what remains is wholly of generic application. The absence of any notice of a throat-sinus adds negatively to the probability of the specimen before me being correctly referred to *T. longimanus;* while, on the other hand, the whiteness of the base of the fur, which is conspicuous when that of my animal is ruffled by handling, is not a likely feature to be quite overlooked. However, if it should prove to be the only Calcutta species, or the only one at all numerous in this district, our doubts may be pretty safely set aside about the correctness of the identification.

T. fulvidus, Nobis.—Of this species I found two males and a female preserved in spirits in the Museum of the Asiatic Society, but cannot learn where they were obtained; though I have been informed that it is common at Darjeeling. It is smaller than the last, with proportionally smaller ears, a deep throat-sinus, and fur pale fulvous-brown at base, grizzled towards the extremity with darker-brown, the extreme tips whitish: some have the nape and interscapulary region ungrizzled fulvous, and the under-parts are more slightly grizzled than the upper: face very pale, and membranes also of a light colour.

Length of the finer male $4\frac{1}{8}$ inches from nostrils to tail-tip, the membrane extending $\frac{3}{8}$ inch further; alar expanse $13\frac{1}{2}$ inches: length of the female, to end of tail, $3\frac{5}{8}$ inches, and alar expanse 13 inches. Tail (of the male) 1 inch, of which half would seem to be enveloped in the membrane and incapable of protrusion, nor does much of the remainder appear to be capable of being sheathed when the membrane is ex-

tended; though this may perhaps be owing to the parts having become rigid by lying in spirits: ears, posteriorly, $\frac{3}{8}$ inch, and anteriorly, to the lobe even with the mouth, $\frac{5}{8}$ inch; their breadth at base $\frac{3}{8}$ inch, exclusive of the duplicature of skin over the eye; and tips apart, as they lie flatly outwards, $1\frac{3}{8}$ inch: length of fore-arm $2\frac{3}{8}$ inches, and from wrist to extremity of wing $3\frac{5}{8}$; tibia 1 inch; and foot, minus the claws, nearly $\frac{1}{2}$ inch: beneath the nostrils is a duplicature of the upper-lip, (rudimental in the preceding species,) divided except in front, and merging laterally into the inner surface of the lip; under-lip reflected as usual: the throat cavity fully developed, but rather less so in the female: colour of the fur as described.

T. brevicaudus, Nobis.—For this species I am indebted to the kindness of Dr. Coles of Madras, who presented to me, for the Society, a collection of skins of Mammalia obtained at Travancore, among which was a single specimen of this Bat, which is at once distinguished from its known congeners by the shortness of its tail.

Length, from nostrils to end of tail, about 3 inches, the tail $\frac{5}{16}$ inch, and entirely enveloped in the membrane, though perhaps merely sheathed in it, and capable of some protrusion; the membrane extends considerably less backward beyond its tip than in the others: alar expanse about 13 inches, or perhaps rather less: ears posteriorly, $\frac{1}{2}$ inch, or anteriorly, as in the others, $\frac{5}{8}$ inch; their breadth at base $\frac{1}{2}$ inch; and distance of the tips apart, as they lie flatly outwards, $1\frac{1}{2}$ inch. Length of fore-arm $2\frac{1}{2}$ inches, and from wrist to end of wing $3\frac{5}{8}$ inches; tibia nearly $\frac{7}{8}$ inch, and foot, exclusive of claws, under $\frac{3}{8}$ inch. No sign of throat-sac in the specimen, and the merest trace of the excrescences under the lower jaw. Fur dingy-white for the basal half, the remainder dusky-brown with light brown at the extreme tips, which last is more developed on the under-parts. Membranes apparently pale, and face dark.

In conclusion, let me avail myself of the present occasion to request from those who may be interested in the elucidation of Indian Zoology, to lose no opportunity of securing specimens of as many species of Bat as fall under their observation; these should be placed in spirits (though not too many in the same vessel, or they speedily decompose); and in the present state of our knowledge respecting the species inhabiting India, it is desirable that many examples of each kind should be preserved for distribution to different Museums, by which means a certainty of

1 Taphozous fulvidus. 1:2 T. Longimanus; 3 Head of do:

the correctness of the names attached to them can be ensured, and the value of the specimens thus enhanced. At present, the Museum of the Asiatic Society is sadly deficient in species of this interesting family.

December 5th, 1841.

Extracts from a Report on subjects connected with Afghanistan. By Dr. Griffifth. *Communicated to the Editor, from the Political Secretariat of India.*

PART III.

Natural Productions.

Wild Animals.—None of the wild animals of the country appear to be of any considerable importance. They are comparatively speaking, few in number, and none attain any large size. The most important from their size, and probably from numerical extent of individuals, are the wild sheep and wild goats, of which last there are probably three distinct species, at least, in the country. The chase of these animals for their flesh, which is, I believe, held in considerable estimation, both by Europeans and Afghans, is attended with considerable difficulty and exposure, and is principally confined to the winter months, during which these animals are forced to take up lower ground. The animals of the above nature known to me are,—

1st. The Wild Sheep, *Ovis Argali?*—The only specimen of this I have seen alive was in the possession of Captain Ferris, at Peshbolak. With the head and barrel of a sheep, it had the legs, the muscularity, and activity of the antelope kind. Nothing can be imagined greater than the agility and sure-footedness with which it would gallop along the top of the narrow ramparts of an Afghan fort, and precipitate itself down from its bastions. It was perfectly tame, and naturally gentle; and seemed to prefer Europeans to Hindoostanees. In choosing its companions and females, it was by no means select, and appeared quite capable of pleasing a whole flock of ewes and she-goats. I regret to say, that perhaps from want of any very great affinity between the species, no marked breed has resulted from this extensive crossing.

Of wild goats, I believe I have seen portions of two species, one of which was sent me by Captain Macgregor. I have never seen either alive. A species of Ibex also exists, with this I am only acquainted from the horns, which it is the custom to attach indiscriminately to the *Zearuts*, and places of sacred note.

From the forests of Olipore, I procured a species of Antelope of the Goral kind; this is known to the natives of those regions by the name *Suga*. Other species doubtless exist in the dense forests of that part of the country, such, for instance, as the Musk Deer. I also heard of another ruminating animal, which the Olipores called Goomast; but their description was so extraordinary, that I could make nothing from it.

Afghanistan possesses wild Asses, but these are confined to the western and north-western parts of the country.

From the general scarcity of jungle and of animals, the country derives one advantage at least, in the absence of the larger carnivora. Mr. Elphinstone, in his very excellent and extraordinarily accurate account of the kingdom of Cabul, mentions, but with doubt, the existence of Lions in the hilly country about Cabul. If Lions do exist in any part of Afghanistan, they must be looked for, it appears to me, to the West.

Of Tigers.—I did not get any information; for even about Olipore, where the upper part of the hills is covered with forest, the lowermost parts and the sides of the vallies do not present much deviation from the ordinary Afghan nakedness, and this is ill-suited to what we know of the habits of these animals. Leopards exist about Chugurserai, and probably in all the wooded portions of the Sofaid-koh system. A large wild Cat, with a tendency to the Lyncean tuft on the ears, is also met with about Olipore.

A large and a small species of Fox appear to exist. The former, which is perhaps identical with the large Himalayan Fox, I procured from Quettah and at Olipore, at which place it is not uncommon. The small kind seems to resemble the Fox of the plains of N. W. India. Jackalls were observed at Quettah, and in the Koonur valley. Of Wolves and Hyænas I did not hear, although the nature of many parts of the country would appear, from what is known of the habits of the Indian species, well adapted to them. Of this I am quite sure, that if they do exist, their existence must be more than ordinarily

precarious, especially during the summer months, when the flocks are driven far away into the high districts. The other carnivora known to me are the Mungoose, and a small prettily marked animal of the same family, which I saw alive in the possession of an officer of H. M. 13th Light Infantry.

Wild Hog occur in some parts, such for instance as the valleys of Jellalabad and Peshawur; in certain parts of which last, along the Cabul river, they are reported to be numerous. No domestic swine are to be seen in the country, the untravelled Afghans therefore cannot appreciate the reasons which led to their being denounced as unclean. They do not, however, hold them in less abhorrence than the Mussulman of Hindostan, who has daily evidence of their filthy habits. Afghanistan possesses one species of Hedgehog of small size with large ears. It is among the rat-like or rodent animals that the greatest variety in form is to be found. In this direction, as in the Flora, the transition between Afghanistan and India may be observed in the dry parts of our extreme N. W. provinces.

Of these animals two only exist of any size; the largest is the Porcupine, which is to be found in the lower parts of Eastern Afghanistan, and a Marmot of about the size of a Beaver, which I have seen on the mountains about the Hageeguk Kaloo and Erak passes, on which it occurs between 11,000 and 12,000 feet.

It attracts notice chiefly by its loud whistling, but otherwise is a very wary animal; it may be occasionally seen sitting erect on its hind quarters at the entrances to its burrows. Of the smaller rat-like animals, several species exist in the collection: the most striking, from its novelty, elegance of form, and agility, is the Jerboa, which was first seen at Quettah, and was afterwards found to be of pretty general occurrence throughout the moderately elevated parts of the country.

One species of Hare was observed to be tolerably common along the valley of the Turnuk. There are, however, probably two other species in the country, as I observed one in a very different locality among the hills at Targeen, and another among the snows of the Koh-i-Baba. No Rabbits exist: their place is perhaps supplied by a species of Lagomys, not uncommon in rocky ground about Cabul, and perhaps generally between an elevation of 6 and 8,000 feet. By some of the officers these little animals were said to have been eaten as Rabbits.

Although not with strict propriety referable to a division headed Natural Products, which, in the excellent statistical arrangement of that wonderful man, Dr. Buchanan Hamilton, is limited to those things supplied by nature without the assistance of man, I have appended to my brief notices of the wild animals, those of a domestic nature.

Domestic Animals.—These are horses, ponies or yaboos, asses, mules, camels, or dromedaries, oxen, buffaloes, sheep, goats, dogs and cats. On the whole in this branch of domestic property, Afghanistan may be considered as rather rich.

Horses.—The horses are heavy, but are said to be enduring. I suspect that their qualities, as well as those of the Toorkistan horses, have been a good deal overrated. On this point, however, I am not competent to remark, besides Government must be in possession of abundant information, as to their value for Cavalry or Draft purposes. The mode of treatment of horses by the Afghans differs considerably from that in use among us. Afghan horses have their stated and defined meals; with us, food is always before them. I think the Afghan plan is the more natural of the two.

Ponies.—The ponies are chiefly used as beasts of burden, for which purpose the larger and stronger kinds are admirably adapted. These, however, are not easily procurable. Although expensive to feed and keep in good condition, the quickness with which they get over the ground, and the ease with which they surmount the obstacles presented by bad roads, renders them greatly preferable to camels.

Asses.—The native asses are not very fine, but those imported from Turkistan are perhaps among the finest. The males are sent across the mountains, they are generally white, have their nostrils slit, and fetch a high price, say 100 to 120 Rs. at Cabul.

Mules.—Very few fine mules are procurable even for very high sums. Although not so fast as yaboos, which in the hands of Afghan drivers seated on the top of a load of 3 and 4 maunds, will go at the rate of 5 miles an hour for 15 miles; they are more enduring, and much less expensive to keep; on the other hand, they are said to be more liable to be galled.

Dromedary.—The Afghan dromedary is decidedly a very fine animal, remarkably different in general configuration from that of Hindoostan, having a round, handsome, and compact barrel, and short

strong legs. The outline of the head and face are very different, and the upper lip is much less pendent. The under-hair or wool of the dromedary affords excellent materials for warm, strong, and cheap clothing, and the Afghans avail themselves largely of it. In this country, these animals are always driven, not led, neither are they incommoded with a nose string. Hindoostan camels are not adapted to the climate of Afghanistan, or the stony surface of the country; it was found, that unless as well cared for as horses, they are by no means enduring animals, being exceedingly impatient of cold and wet; and though not great drinkers, impatient of the want of water. Although the Indian camels accompanying the Army of the Indus underwent great hardship, and suffered from change of diet or absolute privation, yet great part of the great loss was occasioned by the cruelty and carelessness of the *surwans* or camel-drivers; than whom, even in Asia, a more worthless set does not exist. Captain Fraser of the Cavalry was one, among the very few officers, who did not lose a single camel between Ferozepore and Cabul. From his experience it would appear, that with good grooming, clothing, and feeding, the Indian camel may be depended upon. Perhaps this may be deemed worthy of some attention. At present the well-being of the carriage of an Army is almost entirely left to the natives, who in addition to their other bad qualities, are merciless and most improvident masters. At Urghundee, I counted about 20 camels, which had recovered after having been deserted and deprived of a large portion of skin containing the mark, which it was necessary to shew to secure compensation. On grooming and clothing I am the more inclined to lay stress, as I am aware that the Government camels always had, whenever it was procurable, a liberal supply of grain.

Camel.—The Bactrian camel is not common in Afghanistan, the cross between it and the dromedary is a remarkably handsome and valuable animal. Of the remaining domestic animals, only the sheep, goats, and one or two breeds of dogs, are worthy of any detailed notice.

Sheep.—The sheep, are all dombas, like the Cape sheep, remarkable for the great development of fat in their tails. To the Afghans they are of inestimable value, supplying them with cheap clothing admirably adapted to the climate, with milk, and the favourite preparation from it, *kroot*, a sort of dry curdle, which did not appear to me at all

palatable, also ghee, and I believe oil. The flesh varies a good deal, but generally was not much esteemed by us. When gram-fed it is, I believe, excellent.

The sheep are very numerous, and are generally the property of the Nomadee tribes, whose character might make us look with suspicion on the alleged innocence of the pastoral lives of old. In the cold weather, so far as I have seen in eastern Afghanistan, they are congregated in the low districts; at this season I have seen vast flocks about Lalpore and Dukka. At the commencement of the hot season, they are driven to the high grounds, such as the Hazarah country, between Cabul and Bameean. Each flock appears to be generally led by a goat, to whose movements the sheep pay implicit attention.

Goats.—Goats are also numerous, and perhaps equally worthy of attention, their wool is used largely; and appears to be a promising article. These and the sheep are the only animals that could derive sufficient nutriment from the Afghan mountains, which generally speaking, are remarkably deficient in grassy vegetation. I think they feed principally on the aromatic and thorny plants, which form the principal mass of the vegetation.

Dogs.—The common dog of the country appears to approximate a good deal to the Pariah of the plains. But the Tajee grey-hound, a large handsome animal with exceedingly long curly hair about the legs and ears, (I speak of the animal as I have seen it at Cabul in the summer,) might be introduced into England perhaps with advantage. Although doubtless much less speedy than the high-bred English grey-hound, in their *bone* they may be found to possess advantages which it might be desirable to transfer; the Afghans are also said to possess excellent pointers, but of these I have no personal knowledge.

Agricultural Products.

Of the cerealious or culmiferous plants, Afghanistan possesses wheat, barley, rye, rice, Indian corn, and millet.

Wheat.—Of these, wheat and barley are the most important generally, although rice and maize, especially the former, constitute a considerable proportion of the summer cultivation. Some of the Ghuzni wheat was considered particularly fine. I sent some of the finest I

could get in India for transmission to England, but am not aware what value was assigned to it.

In connection with this, I may mention, that there is an important remark in Dr. Falconer's report on the Seharunpore garden, on the inferior nature of the albumen of our Indian grains. Government might probably deem it advisable to encourage the transmission of specimens of all the finest sorts from Afghanistan to India; some of those of Candahar may reasonably be expected to turn out well adapted to India.

In endeavoring to effect this highly desirable purpose, the following remark of Dr. Falconer should be kept in view, as a guide to the selection of the finer kinds:—"The body of the seed of the European wheat was formed of a farinaceous powdery albumen, which flew off into a dust on crushing; while the Indian grains were seen to consist of a hard horny-looking albumen, which was broken with difficulty, shewing what English agriculturists call "a sleety body" and indicating a comparatively very inferior grain. Throughout Afghanistan, wheat may be considered as the staple grain of the inhabitants. It is generally eaten in the shape of bread, baked in flat oblong cakes, about an inch thick; the better kind is very light and well flavored."*

Barley.—Barley appears almost exclusively used for feeding horses.

Rye and Oats.—I do not remember rye occurring as a distinct crop; but it is not uncommon, as a mixed one. The same may be said of their oats, but these perhaps are really wild. The greater part of many of the fields about Bamean consisted of oats, but as the grain ripens, and falls out before the wheat is ready for the sickle, the only use it can be of is, as affording straw for winter fodder.

Rice.—Rice occurs extensively about Cabul, the highest elevation at which I have seen it cultivated in Afghanistan is about 7,000 feet. It is all of the wet or *shallee* kind. The only particularly fine rice grown west of the Indus, is that called *shallee bara*, grown near Peshawur. The production is very local and very limited; introduced elsewhere it appears to degenerate into the coarse common kind. It has a long grain, and is of such esteem, as to be among the list of presents between crowned heads of the North-west.

* It is from wheat that the favorite article *fuloodah* is made; this appears to be some thing analogous to our vermicelli.

Maize.—Maize, or Indian corn, is largely cultivated, especially about Peshawur, where its flour is said to constitute the chief sustenance of the inhabitants. Sorghum and bajra are likewise frequent in the lower parts of the country.

All these enter into other uses than merely giving nutritious grains. The young wheat and barley are cut, and given as green fodder to cattle; this is esteemed especially serviceable in improving condition, and is known by the name of khased. The straw of all is taken great care of, and chopped up into boosa.

The stout stemmed kinds, as Indian corn, sorghum, and bajra, are given entire to cattle, who eat the leaves and the ears; they are stored for winter fodder at least in some parts, and are then cut into small pieces, in this state it is called khurbee. None of the other grains are worthy of notice, the supply being limited, and the product very inferior.

Of leguminous grains, the Afghans cultivate muttur, a sort of chunna, oror moong; but I know of none so good, or so extensively useful, as to merit detailed notice. As might be expected, with the exception of muttur (peas), these are confined to the warmer and more tropical parts; all may be observed about Jellalabad.

Oily-seeded Plants.—Of oily-seeded plants, mustard is the one universally cultivated; they have also another species chiefly confined to the lower districts, in these also sesamum, or til, may be met with. The country also possesses linseed, but I have never seen it extensively cultivated.

Sugar.—The only place in which I noticed sugar was in the valley of Jellalabad, where it occurs to some extent. It appears to be the same kind as that in common use throughout the North-west. The chief supply of sugar, which from the fondness of Afghans for sweet-meats must be considerable, appears to be derived from the plains. Coarse sugar-candy, in flat cakes, was procurable in 1840 at Cabul, for one-half to two seers the rupee; a coarse kind of Russian loaf sugar, was common also in the market.

Cotton.—Cotton is entirely confined to the lower districts, a good deal is cultivated about Jellalabad. Two plants are cultivated for their colours.

Madder.—Safflower and madder. The former occurs extensively about Cabul, and is perhaps worthy of a more detailed notice than I

am able to give it. Madder is confined, so far as I know, to western Afghanistan. About Candahar it is common; it is planted on trenched ground; the green parts are given as fodder to camels; the roots are allowed to remain untouched for two, three, or five years, or even seven, the quality of those dug up early is inferior. The price is, I was told, six Hindoostanee maunds for one rupee. Madder forms an extensive export to Bombay; it is, I believe, the same species as that cultivated in Europe.

Tobacco.—Tobacco of excellent quality is grown about Candahar, chiefly I believe in the valley of the Arghandab. This again is one of the agricultural products, upon which detailed information, accompanied by samples, is necessary.

Natural Grasses.—No valuable natural grasses occur, it would appear, in Afghanistan, except on the Chummuns. The doab-grass is found throughout, but I do not think it is used by the Afghans. No hay is made in any part of the country I have visited, throughout the poorer and less favored districts, such for instance as the Hazarah country between Cabul and Bamean; the wild plants of the hills are cut almost indiscriminately, and when dry are carried to the villages, and stored on the roofs of the houses and towers for winter use. The various kinds of thistles, the large leaves of the rhubarb, and indeed the whole of such plants as are absolutely not too dry to afford nourishment, are thus made use of.

Artificial Grasses.—To supply the wants of fine natural pasture grasses, Afghanistan possesses very fine artificial ones in lucerne and clover, these are extensively cultivated, requiring no great care, but plenty of water. In the green state, they constitute the greatest, and most valuable part of the food of the cattle, and in the dry state, in which they are twisted into coarse ropes, they are extensively used during the winter months.

The lucerne is the same species as that cultivated in the North-west parts of India and Europe; it occurs throughout the country at almost every altitude.

The clover, which is unlike any of the English cultivated species I remember, is a beautiful, and when in flower, a very fragrant plant, it has long succulent tender trailings, stems, and heads of bluish flowers. It first attracted my notice about Ghuzni; it is common at

Cabul, and about Khujjah, below which I do not remember having seen it. By the Afghans it is not so much esteemed as lucerne.

Of the number of seeds despatched by me, by order of his Lordship the Governor General in Council to the Superintendent of the Seharunpore garden, for transmission to Europe, these two would appear to be by far the most valuable, indeed perhaps the only ones worthy of introduction into Europe. The accounts that have appeared of their success, especially that of the lucerne in Ireland, are particularly interesting, and very gratifying to me.

Vegetables.—In vegetables Afghanistan is very poor, although Mr. Vigne has published a list of the Cabul vegetables, worthy of a Covent Garden market; the whole may I think be summed up in the following list: cabbages, cauliflowers, beet-root, spinages, radishes, carrots, banguns, lettuces, cucumbers, onions, and garlic.

Of these only the beet root and cabbage are worthy of notice. The extensive introduction of good European vegetables would confer a real boon on the country. Sir A. Burnes several years ago introduced the potatoe, but on his return to Cabool with the army, he found they had all been lost.

Flowers.—The Afghans do not appear to be skilful florists; no one of their cultivated flowers is worthy of notice. I remarked at Candahar and Cabul, roses, jessamines, marigolds, pinks, sweet-williams, poppies, larkspurs, stocks, wallflowers, narcissuses, flags and China asters, which last are the handsomest, and of the most varied colours.*

Fruits.—In fruits the country is remarkably rich, and although the Afghans are acquainted with grafting, the perfection to which several of the finer fruits has reached, appears to me remarkable; it certainly is more attributable to the climate, than to any skill on the part of the Afghans; there is every reason for believing, that from the improvements they will become acquainted with from their intercourse with us, Afghanistan will become one of the finest fruit countries in excellence, and variety of product. Should success ultimately attend the praise-worthy efforts of Drs. Royle and Falconer to introduce cuttings, &c. overland, Afghanistan should not be omitted in the distribution. Fruits in this country are of a more important nature than

* Hawthorn trees, and the famous Arghawan, occur in Baber's garden at Cabul. This last is, I believe, Cercis Siliquastrum of Botanists.

they are in India, or perhaps most other countries in which they are not generally to be considered as absolute necessaries of life. In Afghanistan, however, several kinds assist very largely in the sustenance of the bulk of the population.

Few things can be seen more striking to a person accustomed to India, than the display of fruit in the markets and shops of Cabul; few things more astonishing than their very low prices. Even after the whole army of the Indus had been encamped at Cabul for some weeks, they still continued remarkably cheap.

The Afghanistan list of fruits includes

Apricots (zurd-aloo), two or three kinds,
Peaches (shuft aloo),
Nectarines,
Plums (also bokhara), several kinds,
Bullaces? (aloocoa),
Cherries (aloo waloo),
Apples (saioo), several kinds,
Pears (nass puttee), two or three kinds,
Quinces (bhel),
Pomegranates (unnar), two kinds,
Grapes (ungoor), several kinds,
Musk melons, (khur-booja, gurm),
Sinda ditto, (khur-booja, surda),
Water ditto, (turboozah),
Mulberries (toot), two or three kinds,
Walnuts (char mughz),
Figs (unjeer).

Of these, the most important, as constituting an article of food in large consumption by the mass of the inhabitants, are the common kinds of apricots, plums, grapes, melons, and mulberries.

The best flavoured fruits, and generally they may be pronounced excellent, however disfigured and liable to be bruised, they are by the dirty and rude hands of the Afghans, are the khaisee apricots, peaches, nectarines, most of the grapes, the musk melons, the smaller kind of pear, the large red mulberry called shahtoot, closely resembling the good English mulberries, and the seedless (or bedanah) pomegranates.

Most of these fruits are consumed in the country ; some, such as a large thick-skinned grape, (like the exported Portugal grape), the seedless pomegranate, walnuts, apples, and figs are exported ; but with the exception of the grapes, perhaps, in no great quantity, large quantities of the thick-skinned grapes alluded to are consumed in winter throughout the country.

From many preserves are made, and commonly sold in the bazaars. Some again, especially the apricot, kissmiss grape, fig, and white mulberry are prepared by drying ; the apricot in this state, is, I believe, called goobani. The dried mulberries abound in saccharine matter, and are used to a considerable extent, as is likewise the dried kissmiss or raisin.

The peaches are of large size, and good flavour, but are generally damaged by premature plucking and rough usage, the Afghans not being acquainted with the European niceties attended to in gathering such fruits. Nectarines I did not see, but I was told that they are grown at Candahar. None of the plums are particularly good, and the cherries are much more adapted for preserves, than for eating fresh.

Of the several kinds of grapes, I prefer the kissmiss ; this is a small roundish, seedless, grape, of a greenish colour, tinged with brown when perfectly ripe. Besides this, Afghanistan possesses a very large oblong fleshy purple grape ; a green grape of similar properties, other respects than colour, chiefly kept for winter use and for exportation ; a large highly flavoured round purple grape ; a dark purple round sweet grape, with very large and very small fruits on the same bunch, the small ones being seedless. All these, and I dare say more may be procured at Cabul or Candahar. There is also a very large round subfleshy green grape, the *ungoori kuttah*, which is produced along the N. face of the Sofaid Koh, as about the Khujjah district.

The surda melon is, I think, unknown in India ; it is very distinct, apparently both from the musk and water melon, is of an oblong shape, with firm whitish flesh ; it is sweeter than the musk melon, to which I think it very inferior. It must be remarked, however, that it is said only to attain its perfect flavour after having been touched by the frost ; it is in extensive use throughout the earlier winter months.

The seedless pomegranates have a high reputation. I never was fortunate enough to meet with really fine ones.

To the list may be added perhaps the zurishk or barberry, which is generally eaten as a preserve; a sort of bhair called aral; the dried pulp of the sinjit, a species of Eleagnis, commonly planted about water-courses in the finer vallies and an Hippophaee, which I was told was considered a fruit at Cabul. Date trees, but very few, occur at Jellalabad; this fruit is imported in considerable quantities. Citrons also are common in the Jellalabad gardens. The palm of superiority of fruits is I believe, disputed by Cabul and Candahar. Ghuzni is celebrated for its plums, to which, and to apples, its supply is chiefly limited. The fruit season lasts throughout the summer months; there will of course be some difference between the seasons at Candahar and at Cabul. The earlier fruits are chiefly confined to such stone fruits as cherries and plums. The grand season at Cabul is in August and September. The most widely distributed fruit tree is the common mulberry; this is found everywhere, up to elevations of 8 and 9,000 feet; wherever there is a village, there will be found the white mulberry.

The range of the apricot may be stated as between 3,000 and 8,000 feet, it is also met with higher, but scarcely produces beyond that elevation. I have seen it in the Erak ravine as high as 10,500 feet. Walnuts are, so far as I know, limited to considerable altitude, such as that of Cabul, 6,400 feet.

Pomgranates range from 1,200 to 5,000 feet, at Khujjah; 4,500 feet above the sea, they are said to attain great perfection. With regard to cultivation, I am not aware that any great skill is applied. To the unclouded summer sky, the great dryness of the air during the season, the goodness of the soil, and facilities of irrigation, I am inclined to attribute the good qualities of the fruits. It is scarcely necessary to add, that all the trees are standards. Most, if not all the stone fruits, as well as the apples, pears, and mulberries, are planted as orchards. The grapes at Candahar are planted in trenches, to the north face of which they are confined; in most other parts, they appear to be allowed to scramble over trees.

Introduction of the Afghan fruits into India.—A good deal has, I believe, been said of the probability of the successful introduction of the Afghan fruits into India. But if we look at the opposite peculiarilies of the two climates, to speak generally, we are not, I think, warranted in expecting such a result. I do

not wish to disparage such attempts, but it appears to me that in all such inquiries there are certain requisite preliminary considerations to which no attention is generally paid in India. In Afghanistan, we have a considerable increase of latitude, accompanied by a considerable increase in altitude, at least so far as the great fruit districts are concerned. We have a cold or a very severe winter, during which, and also about the vernal equinox, snow or rain falls to a considerable amount, constituting as it were a sort of monsoon. This is succeeded by an almost absolutely dry summer and autumn, during which the sun exercises an unchecked and powerful influence. These two last circumstances are, I believe, essential to the perfection of what we call the later European fruits. In what part of the continent of India can these circumstances be found? We may command elevation, but in no Indian climate known to me can we command a cold winter, a genial spring, and a fine summer. In India on the plains, the spring months are very hot, and the time of ripening of the later and better fruits falls in the rainy season. The Coromandel coast agrees with Afghanistan in the distribution of the rainy and fine months, but in no other circumstance. If we go to the hills, we become exposed to an increased severity of summer rain.

No fruit-bearing plant of Afghanistan can, I think, be reconciled with any success to such extremes. It is curious that Peshawur, which has an Afghan climate, so far as rainy winter months and a dry summer are concerned, does not possess, perhaps, a single superior European fruit. Can we infer from this, that a certain amount of winter cold is required for the attainment of excellence? With Bengal Proper, I would not advise interchanges to be made. If it be considered advisable to introduce the Afghan fruits into the N. W. provinces, which have a very different cold weather and rainy season from those of Bengal, I would beg to suggest that the introduction be carried on from Candahar. I find on referring to my journal, that grapes and musk melons were coming into season about the 15th or 20th June. This is about the period of the setting in of the rains in the N. W. as about Merut; but the smaller amount of cold of the Indian winter, and the greater amount of heat of the spring, would doubtless cause the ripening to occur earlier, so that the fruits would be exempt

from the injuries of rain. If introduction into the Himalayas be deemed desirable, Cabul should be the place of supply, unless there is some unexpected affinity between the amount of solar heat of the spring months these mountains enjoy and that of Candahar. And perhaps attention should be chiefly directed to those fruits that are in full season before the middle of June.

General Nature of Afghan Vegetation.—Before entering on a few brief notices of those vegetable productions which are not cultivated, but which administer to the wants of the people, it may be as well to premise a few popular remarks on the general nature of the Afghan vegetation. No parallel can be drawn between the Afghan Flora and that of India in any part; for even in the lower parts of the country, but very little elevated above the general level of our extreme N. W. Provinces, the Flora of Afghanistan is decidedly peculiar.

Line of transition from Indian to Afghan Vegetation.—The transition commences, as may be said, along the Sutlege: on the Ferozepoor route it is gradual, on that of Shikarpore it is much more abrupt. At Peshawur, which is in north latitude 34°, and about 1200 feet above the sea, it is tolerably mature, still there is an intermingling of Indian species, and this continues, gradually becoming less, until one ascends to Gundamuk.

In Kutch Gundava, the Indian forms are less frequent; indeed it may be said that by the Ferozepoor route the Indian species encroach on the Afghan territory; in Kutch Gundava the Afghan species encroach on the Indian territory.

The Afghan transitionary forms are various: Borragineæ, Reseda, Chenopodiæ, Bertholletia, Farselia, Medicago, Butomus, Peganum Harmali, Nerium oleander, Alhagi Marorum? The Indian transitionary forms consist of Calotropis procera, certain Amaranthaceæ and Chenopodiæ, certain Saccharineous and Paniceous grasses, Acacia, Arabica, and pudica, Prosopis spicigera and Dalbergia Sissoo.

Proper comparison only with the Flora of the Levant, &c.—To gain a just idea of the Afghan Flora, we must compare it with that of the Levant, and perhaps with the greater part of the basin of the Mediterranean, with which it may be said to correspond in latitude. With the general Flora of Persia it may be regarded as continuous.

Extent of Mediterranean Province.—Few things can be more striking or worthy of comprehensive investigation than this vast extent of the Mediterranean or Australo-European Botanical province. Dr. Falconer told me, that he had ascertained it to prevail a long way to the northward and eastward of Afghanistan; and I have materials for shewing, that it characterizes the country on the N. face of the Paropamisus, between Maimuna and Bamean, and from the mission of Meyendorff to Bokhara, to which my attention was directed by Sir A. Burnes, it is evident that it equally characterizes Bokhara, and the country between it and Orenburgh.

On this subject, I shall enter into details in the purely botanical part of my report, which I shall have the honour of submitting with the arranged collection.

Features of the Afghan Flora.—The striking features of the Flora as compared with India, are the scarcity, generally amounting to absolute want, of indigenous trees, a general poverty in variety of form, the general prevalence of forms characteristic of Southern Europe, the abundance of the large European families, such as cruciferous, umbelliferous, &c. plants, and of those forms of Compositæ known to Botanists as Cynarocephaliæ, and of which thistles may be mentioned as familiar instances; the common occurrence of bulbous monocotyledonous plants, such as Tulips, Hyacinths, Onions, &c. the nature of its grasses, and the scarcity of Orchidleæ and Ferns, which may be said to exist only in Eastern Afghanistan.

The number of aromatic plants, the prevalence of thorny species, and the very general occurrence of the flowering periods in the spring months, are also deserving of notice.

From almost all the forms being what are called European, it follows that no transition in form occurs consequent on variation of elevation, similar to that which has been so much noticed by all travellers in the Himalayas, and other high Indian ranges. In this we are accustomed to associate height with the appearance of forms familiar to our earlier days. In Afghanistan it is not so, and it is remarkable enough, that even the summer Floras of its lowest parts, which have as high a mean summer temperature perhaps as any in the world, are still characterised by a majority of European forms. In high or in low, in hot or in cold situations throughout Afghanistan, forms charac-

teristic of an European climate will be found to prevail. The traveller may pluck roses, pinks, hyacinths, sea-lavenders, kochias, eryngos, catchflies, flags, &c. at an elevation of 1,000 feet, as well as that of 10,000 feet. It would perhaps be difficult to find many generic forms characteristic of altitude.

Ordinary visitors would be likewise much struck with the circumstance, that a total change in the indigenous plants may exist, while there is little or none in those cultivated. Thus at Cabul, where the winter is so severe, and where heavy snow lies for two or three months, and about which not an indigenous plant, common to India perhaps is to be found, he will see Indian corn and rice cultivated with wheat and barley, rice perhaps forming the prevailing crop. We may see at Cabul the rice fields bordered by poplars and willows; the aspen quivering over the nodding rice. This is easily accounted for; an approach to community of temperature may perhaps be found between the summer heat of Cabul, and the winter and spring heats of the plains of India, which may explain the cultivation of wheat and barley. Between the summer heats of the two countries, there is likewise sufficient community to account for the cultivation of rice occurring in both in the summer.

Brief notices on useful Plants occurring wild.—The accompanying list will be found extremely meagre; but in the first place, the great bulk of the vegetation consists of the large European families, among which valuable products in the wild state are not extensively presented; and in the second, it is drawn up from memory chiefly, for even the casual overlooking of the Herbarium, which is requisite to make it more complete, would delay one considerably in the submission of the report, and I may add, there is no probability of valuable information turning up to compensate for this.

Maizurrye (*Chamærops.*)—Among monocotyledonous plants, that of the most use is, I think, the *maizurrye*, of the Khyburs and Momunds. It is a small palm, and appears to be a Chamærops; perhaps the same as C. humilis of Southern Europe? Should it be distinct, I hope it may be allowed to bear the name of C. Ritchiana, after Dr. Ritchie, the only person who has explored the botanical productions of the Khybur Pass. This plant is extensively used in the manufacture of ropes, or strings for the bottoms of charpaiees,

and of the sandals, so universally worn in the Momund and Khybur districts, and perhaps generally throughout lower eastern Afghanistan.

Salep.—Salep is to be found in the markets of Cabul, at a much lower price than in those of the N. W. of India. A species of orchis is common in marshy places, high up among the Huzarah mountains, but I could not ascertain whether it was from this that Cabul was supplied. There is also an Eulophea in sand islands of the Koonur river, from which salep may be derived.

Umbelliferous Plants.—Among the dicotyledonous plants, the umbelliferous family holds perhaps the highest rank, as affording valuable wild products. In Afghanistan, most of the fœtid, or aromatic fœtid gum resins, such as opoponax, assafœtida, ammoniacum, sagapenum, will probably be found. Of these the most important is the assafœtida, as it is largely exported, and consumed in the country as an adjunct to cookery. It was first announced as existing in the country, I believe, by Sir A. Burnes; it appears to be of general occurrence on the hilly tracts. Probably it is furnished by two species. At Metah, Captain E. Conolly told me, it was produced largely in the hot country of Seistan. He also informed me, that it was collected in conical pieces of paper, placed over a complete section of the plant, at the junction of stem and root.

Prangos Pabularia.—As famous a plant as the assafœtida, exists in the Prangos pabularia. In Afghanistan, however, it certainly does not merit the reputation which Mr. Moorcroft has recorded it possesses in some parts of Thibet. This plant is not uncommon on the Hazarah mountains, at an elevation of 9,500 and 11,500 feet; but it is not used more, either as summer or winter fodder, than most of the plants possessed of any degree of succulence, of the same districts. It is as I have said, cut indiscriminately with thistles, docks, and a host of others, which would surprize an English farmer; this agrees generally with Dr. Falconer's experience.

Maimunna.—The Maimunna, a Rhamnaeous genus, is held in some esteem for its fruit, which for an uncultivated one, is by no means unpleasant. It is common throughout the lower parts of Eastern Afghanistan; the fruit is a black berry of the size of a black currant, and of sweetish flavor. A much more esteemed fruit, which

is sold commonly in the bazars, is the *Goorgoora*, Edgeworthia buxifolia, Fal. This plant was first found by Dr. Falconer about Peshawur, and by him was named after Mr. Edgeworth, a distinguished member of the Bengal Civil Service. Its natural characters are, as it were, intermediate beween Myrsionæ and Theophastreæ, tending likewise towards Sapoteæ. The fruit is roundish and succulent, about the size of a small marble; it is principally occupied by the seed, which is not eatable. I have not seen it fresh. It is considered heating by the Afghans, and this perhaps is the reason of its being common in the bazaars. The plant is generally a thorny shrub: it is common throughout the lower parts of the hills of Eastern Afghanistan.

Sinjit Eleagnus *orientalis?*—The Sinjit, which is probably the Eloagnus *orientalis*, ought perhaps to have been enumerated among the cultivated fruit trees; it is commonly planted along the banks of water-cuts; and is ornamental from its graceful crown and grey foliage. The dried pulp of the berry is eaten, but it is much too sour for European taste.

Pistacia, P. Lentiscus.—The Pistacia occurs, Lieut. Sturt tells me, on the Hindoo Koosh, to considerable extent; scattered plants of it are not uncommon throughout the mountainous parts of the country generally. It is a low tree, the seed constitutes the fruit, and is as much esteemed by the Afghans as almonds are by us.

Chilghozeh Pinus.—Edible seeds, of a very pleasant flavour, slightly tinged with turpentine, are yielded by the Chilghozeh, a species of Pine; the seeds are to all outward appearance exactly like those of the Kunawur Pinus Gerardiana. They are eaten in considerable quantities, the supplies being derived from the Sofaid Koh.

Umlook.—Another wild fruit is yielded by the Umlook, a species of Diospyros; it also occurs in some gardens; it is not worthy of any notice.

Schnee.—One of the most celebrated plants in the country for its aromatic and stimulant properties is the Schnee, which may perhaps be a species of Balsamodendron. It occurs in the Kojuck range, nad is to be met with, though not to such extent, on most others.

Rhuwath.—Another famous plant is the Rhuwath, or Rhubarb, which, as it is also cultivated and in great request, ought to have been arranged with the vegetables. It is the only instance which evinces

the knowledge of Afghans of the value of etiolating or blanching certain plants. I have never seen it, not having been in Cabul in the spring. The wild plant, which, I believe is the original of the cultivated one, is plentiful on the Kojuck range, and also on the Huzarah mountains up to an elevation of 11,500 feet. The leaves of this are used with others as winter fodder, the cultivated Rhubarb might easily be introduced to Simlah, Mussoorie, and Darjeeling.

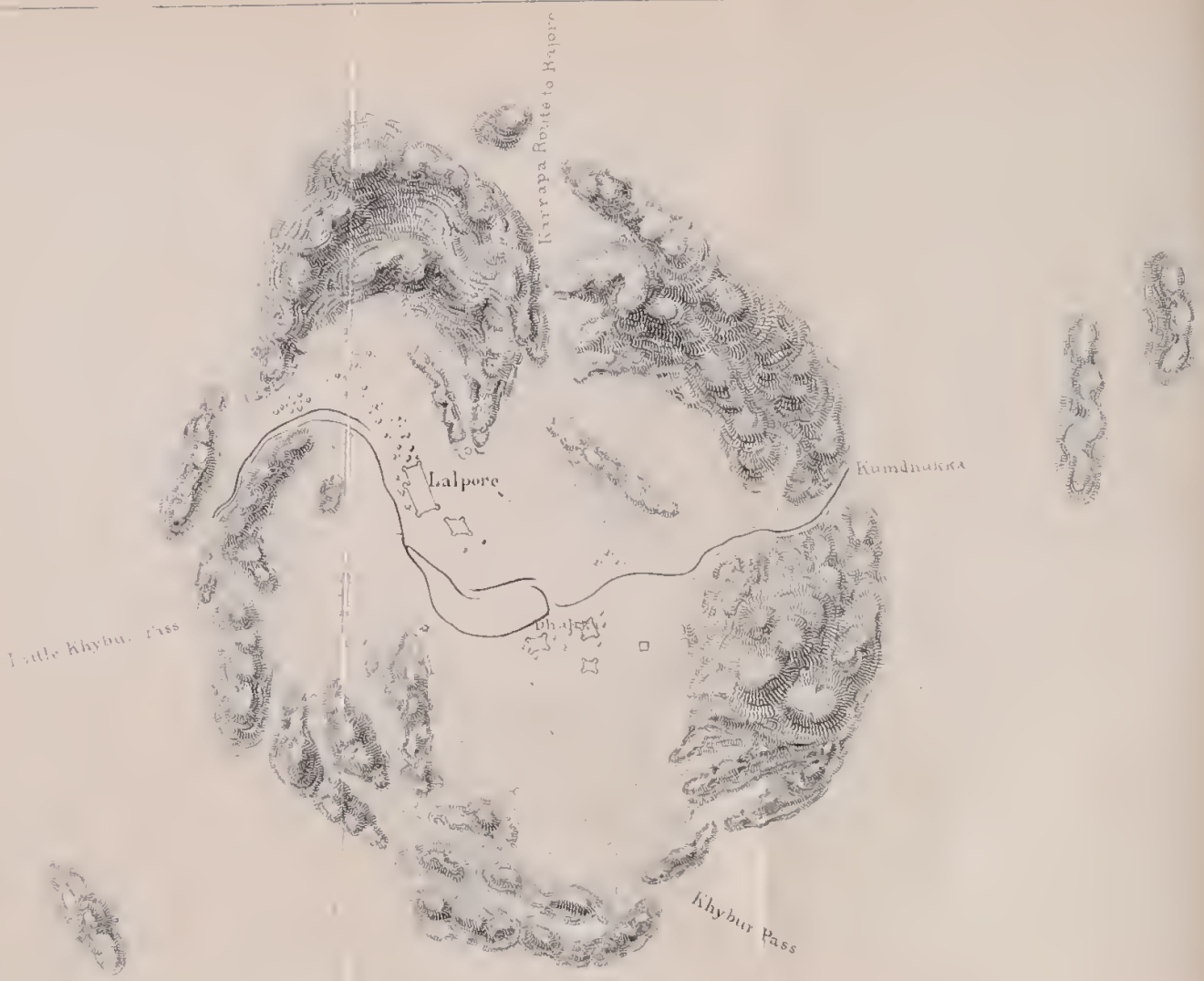
Artemisiæ.—Several of the wild plants of Afghanistan are extensively used as fuel. Those in most common use about Cabul, are species of Artemisia or wormwood, by some of our officers known as wild thyme; they are aromatic, camphorated, low shrubs, and some are eaten by camels. In the loftier districts great part of the vegetable fuel is furnished by the plants known generally by the name of Koollah-i-Huzarah, Huzarah's Cap. They form one of the most prominent features of the Flora, occurring in dense, highly thorny, hemispherical tufts, as unpleasant to touch as the back of a hedgehog. Many species occur. To Botanists they are known by the name of Statice.

Ka-ri-Shootur—Alhagi *Maurorum.*—Plants eaten by camels become, in such a barren country as Afghanistan, invested with a good deal of importance. Generally such are not deficient, but one of the difficulties of the Bolan Pass is occasioned by their absence, and to a similar cause I attribute the great loss of camels on the return to India between Bookhak and Bala Bagh. Of these the most esteemed is the Ka-ri-Shootur, or Jaursa of the N. W., one of the most widely distributed plants, occurring all over the N. W. of India, and all over Afghanistan, up to an elevation of 9,500 feet. This plant is also known as affording the Turunjubeen, a sort of manna-like substance ; the production of this appears to be local, and the only place I was told it was procured in Afghanistan was the Candahar district.

Perhaps the best other kinds of camel fodder are furnished by the Chenopodeæ, or Goose-foot tribe. These abound throughout the country, and are succulent and saline.

Tragacanth.—There is every probability of the true Tragacanth plants being found in the country, the section being one of the most common forms of Leguminosæ.

Daphne.—A species of Daphne not unlike D. Cannabina ; the paper plant of Nepal and Bootan, is not uncommon at elevations of 5,000



VALLEY of DHUKKA or LALPORE

Scale 20[illegible] yards to 1.03 of an Inch

to 6,500 feet. The Afghans only make use of it in the construction of the matches for their match-locks.

Of the timber trees of Eastern Afghanistan an extensive use is not made; the Baloot suffers most, from being most accessible. The Zaitoon wood is remarkably heavy, sinking in water: it has a very close grain, and may be found to possess valuable properties. On the subject of forest trees, I have entered elsewhere.

PART IV.

Natural Defects of Afghanistan.—Small portion of tillable soil.

It appears to me, that there are three natural defects, of more or less general occurrence, throughout Afghanistan, as that kingdom is now limited; viz. small proportion of tillable soil, want of forests, and of water-carriage. Afghanistan is, I think, decidedly a barren and poor country. The tillable part of the soil bears no proportion to that which is untillable.

The untillable majority is composed of either bare rock, the mountainous ranges for instance; or of the inclined planes of boulders and shingle, which I fear must be considered almost as irreclaimable as rock itself.

On the proportions of the tillable to the untillable part, I have no direct observations to adduce. Those proportions are variable, but very generally the irreclaimable parts are in vast excess,* and consequently they oppose a considerable obstacle to any such great extension of cultivation, as would entitle Afghanistan to be considered even a moderately rich agricultural country.

It was a common remark throughout the army, how wealthy the country would be, if stones were a source of richness and prosperity. The stony nature of the country is almost inconceivable by a person habituated to the extensive alluvial soils of British India. It is still more striking, because, owing to the value of the tillable soil, all the roads, with but very few exceptions, are carried over the edge of the glacis slopes; as an instance, and yet it is scarcely an extreme one, I may cite the county between Bala Bagh near Jelallabad, and Bookhak near Cabul, over which the great line of communication with the

* I annex a survey of the valley of Dhukka to shew the proportion of vast excess; the section of the Peshawur valley gives the opposite and more favourable one.

Punjab runs. This distance is scarcely less than 65 miles, and the stones are only varied by the occasional occurrence of patches of dry sand.

These stones and shingle are not merely strewed over the surface of these glacis slopes, but they constitute them entirely, and I do not exaggerate when I mention, that sections may be seen along the course of draining ravines, as much as 60 or perhaps 100 feet in depth.

But although these portions of the country do not appear adapted for any strictly agricultural purpose, there are considerable portions of some of the finer vallies still uncultivated, and it is to these that we must look for extension of cultivation. I shall merely mention such places as presented themselves to my observation; it would be useless to make any suggestions, for a great increase in cultivation has always, and rapidly, succeeded the accession of British supremacy.

Of these vallies I would beg particularly to direct attention to that of Pisheen, in which, on the line of route of the army, I was surprised at seeing so little cultivation. This valley is, if not the largest, among the largest; its general altitude is perhaps 5,300 feet; it is drained by the river Lera, from which the application of the Persian wheel would draw ample supplies for irrigation. The valley is also worthy of examination as to the point of its applicability for a cantonment, instead of that of Quettah, which has, I hear, been found to be decidedly unhealthy. Its extent and openness are greatly in its favour.

When the army was at Candahar, a considerable amount of land both near the city and towards Deh Hajji was found uncultivated. The same remark also applies to the fine and elevated tracts between Mookoor and Nanee. But as in both these instances it was doubtless ascribable to a rapacious and unsteady Government, the tracts alluded to, must already have begun to shew evidences of great and permanent improvement.

PART V.

Minerals and Wool, the two greatest resources of the country—Proposed introduction of useful Plants.

On contemplating the general resources of Affghanistan, in connection with its physical features, and nature of its inhabitants, it appears to me that there are two directions, which may possibly lead to positive and permanent improvement. I allude to Minerals and to Wool.

Minerals.—With regard to the former, I have to observe, that in the absence of coal, which does not appear to have been discovered, the mineral productions are only likely to become useful in the wooded parts of the country, that is, about the great ranges, Sofaid Koh and the eastern end of Hindoo Koosh, such for instance, as the Koonur and Bajore valleys.

On the subject of Minerals, I am not competent to afford any sound information, but I trust that in the prosecution of my experiment, the expence of land carriages, of labour, the general scantiness of streams, and perhaps their general inapplicability, may always be borne in mind.

If mines are ever worked at Taigea, the products will be chiefly limited to the supply of the Cabool markets, for, so far as my information goes, the Cabool river is not used for descent above Balabagh. This may possibly arise from prejudice on the part of the natives, and it may perhaps be considered worth while putting it to the test by means of a survey.

Bajore, I have always understood, to be deficient in streams. Forests of firs and oak doubtless exist on the ranges to the north of the valley, but whether so near to the mine as to be thoroughly applicable, remains to be discovered.

On the subject of minerals, generally, the remark may be made, that those of Afghanistan can only be expected to meet with a market in the country. India is I imagine independent in this respect, and to supply the European market appears to me a problematical assumption.

Wool.—It is to the wool of the country that I conceive especial attention should be paid: the material exists in great abundance, and trading in it will be in perfect unison with the habits of a great part of the Afghan population. A good deal will depend upon the time at which the best shearing takes place; this is stated by Captain Hutton to take place in the summer. If this is generally the case, the wool will be subjected to land-carriage from the higher districts to the lower. Captain Hutton states, that the winter shearings are reckoned inferior from the dirt occasioned by penning; but this scarcely applies to Eastern Afghanistan, throughout all the parts of which known to me, the flocks are in the autumn driven from the high to the low lands.

The great emigrations which thus take place towards Julalabad, will abstract a good deal of the wool, from additional expence of land-

carriage ; the Cabool river being available to Peshawur, or to the Indus. What is first required, is an exact knowledge of its excellence, and the cost, inclusive of every charge, at which it can be delivered first at Bombay, finally in England.

If the properties of the wool be promising,* steps can be taken to improve the native breed by importation of the best foreign stocks. Improvement of wool is stated to depend primarily on attention to the breeds of Sheep, &c. It is also influenced by soil, climate, and food. It has been ascertained that fine clothing wool, the only one, judging from the dry climate, and pastures of Afghanistan, that can be chiefly looked for, may be grown equally fine in most situations, so that the sheep are confined and kept on dry food, a great part of the year. "It may also be grown on the richest pastures, provided these be overstocked to keep the herbage bare." It appears to me, but I beg it to be borne in mind, that I am no authority in such matters, that circumstances intermediate in some degree between dry food and rich pastures, are prevalent naturally throughout Afghanistan. It is also somewhat to the purpose to remark, that the climate of New South Wales is considered extremely favourable from its dryness and mildness, and that great advantage is derived from the absence of briars and underwood. The mildness, though not a feature of the Afghan climate, is obtained by the migrations I have alluded to, and the absence of briars and underwood is complete. The introduction of first rate rams is the main object at first: the offspring of the female appears to be always influenced by the first male with which it has had intercourse. It will be a matter of primary importance, therefore, to commence with best untried ewes and first-rate rams.

"By breeding from a coarse-woolled ewe and a pure fine-woolled ram, the produce of the first cross will have a fleece approaching one-half to the fineness of that of the ram ; and by continuing to cross the progeny with a fine-woolled ram, equal to the first ram in quality, the fleece of the score and cross will approach three-fourths to the fineness of the first, and in a few crosses more will be brought to an equal quality." Breeding in and in must be strictly avoided. But by breeding from a coarse-woolled ram and a fine-woolled ewe, the series will be

* On this subject I have no direct knowledge. For the accompanying remarks, I am indebted to Rees' Cyclopædia.

reversed, and if continued, will be attended by the disappearance of the fine-woolled race.

I know nothing more likely to invite to improvement than the history of wool, nothing that should inculcate more steadily the advantages of interchange of breeds. Sheep's wool appears to be the product of cultivation; no wild animal is known resembling the wool-bearing sheep. The wild sheep of Afghanistan, and indeed all the wild animals of the same family in the country, are covered with short coarse hair of large diameters, under which, and next to the skin, occurs a various proportion of short wool. The effect of cultivation appears to be the falling off of the coarse hair, the place of which is supplied by the increased growth of the wool.

The fine wool equal to the best Merino, now produced exclusively in Australia is entirely owing to the skill and perseverance of a single individual, John MacArthur, Esq. His stock originally conaisted of 30 coarse-haired Bengal ewes, but having in 1795 procured one Merino ram and two ewes from the Cape, he commenced crossing, and by constantly selecting the finest-woolled progeny for breeding from, he at length succeeded completely. In 1802 he came to England, and obtained certain advantages as rewards, he returned with three Merino rams and two ewes. In 1807, he possessed 7,000 sheep, and the better sort of this wool he sent to the English markets, was considered equal to the best Merino in every point, but cleanness.

I have to add, that the signs of fine clothing wools are fineness of fibre, softness, length, and soundness and equality of staple, (by which are meant the locks of aggregated fibres.) The colour should be pure white, and as the weight is materially influenced by cleanliness, this last is an object of great importance to the wool buyer.

Among the manifold ways by which Afghanistan may be made to benefit by its intimate connection with Great Britain, the introduction of useful plants, such as those adapted for timber, for food, or for other domestic purposes, is assuredly not the least in the scale. The plants most likely to succeed are perhaps those of Southern Europe. Some of the most important of those of Kunawur, might also be, I think, successfully introduced: with regard to these, I take the liberty of submiting the accompanying list, premising, that it is drawn up on general considerations, not strict practical knowledge.

List of useful and ornamental Arborescent or Shrubby Plants, adapted to the middle regions of Afghanistan.

Botanical Names.	Native Country.	Uses.
Quercus Robur, W.	Britain, ...	Timber, tanning and dyeing.
,, Hex, W.	S. France, ...	Timber.
,, Suber, W.	S. France, Spain, ...	Cork-Bark.
,, Asculus, W.	S. Europe, ...	Edible Seeds.
,, Virens, Ph.	N. America,...	Excellent Timber.
,, Cerris, W.	S. Europe, ...	Timber, very ornamental.
Castanea Vesca, W.	S. Europe, ...	Timber and fruit, Spanish Chesnut.
Ostrya Vulgaris, W.	Italy, ...	
Carpenus orientalis, W.	Levant, ...	
Fagus sylvatica, W.	England, &c....	Ornamental, and variously useful.
Corylus Avellana, W.	Europe.	Variously useful, Hazelnuts.
Liquidambar styraciflua, ...	N. America, ...	Timber and Gum.
Platanus occidentalis, W.	N. America,...	Timber, ornamental.
Alnus glutinosa, W.	Europe, ...	Timber.
,, oblongata, W.	S. Europe, ...	Timber.
Betula alba, W.	Britain, ...	
,, pendula, North, ...	Europe, ...	Ornamental.
,, populifolie, W.	N. America,...	Timber.
,, papyracea, W.	N. America,... ...	Timber.
,, Cuta, W.	N. America,...	Excellent Timber.
Salix alba, W.	Europe, ...	These species of Willow variously useful, as timber, or more especially for basket-work.
,, viminalis, W.	,, ...	
,, stipularis, W.	England, ...	
,, Fortyana, W.	Britain, ...	
,, rubia, W.	England, ...	

List of useful and ornamental Arborescent or Shrubby Plants, adapted to the middle regions of Afghanistan.

Botanical Names.	Native country.	Uses.
Populus alba, W.	Britain, ...	Wood for turning.
,, tremula, W.	Ditto, ...	Ditto for ditto.
,, nigra, W.	Britain, ...	Wood for turning.
,, dilatata, W.	Italy, ...	Timber.
Ulmus glabra, W.	Britain, ...	Timber.
,, Campestris, E.B.	Palestine, ...	
Celtis Australis, W.	S. Europe, ...	Timber.
Juglans alba, W.	N. America, ...	Timber and edible nuts.
,, nigra, W.	Ditto, ...	Ditto ditto.
,, sulcata, W.	Ditto, ...	Ditto Hickory of America.
,, glabra, W.	Ditto, ...	Ditto and edible nuts.
Salisburia adiantifolia, ...	Japan, ...	Fruit.
Pinus Longifolia, W.	Sub-Himalyas, ...	Timber, Tar, Rosin.
,, Laricio, P.S.	Corsica, ...	Timber.
,, Pinaster, W.	S. Europe, ...	Ornamental.
,, Pinea, W.	S. Europe, ...	Ditto. edible seeds.
,, Canariensis, Buel, ...	Canaries, ...	Timber.
,, Gerardiana, ...	Kunawur, ...	
Abies picea, W.	Germany, ...	Ornamental.
,, Orientalis, W.	Levant, ...	
Larix communis, Sal, ...	Germany, ...	Excellent Timber.
Cedrus Libanotis, Barr, ...	Levant, ...	Ornamental.
,, Deodara, ...	Himalyas, ...	Ditto, excellent Timber.
Cupressus tomlosa, ...	Ditto.	Ornamental.
Taxus baccata, W.	Europe, ...	Timber, the Yew tree.

List of useful and ornamental Arborescent or Shrubby Plants, adapted to the middle regions of Afghanistan.

Botanical Names.	Native country.	Uses.
Buxus sempervirens, W.	Europe, Levant, ...	Variously useful Box.
Stillingia sebifera, W.	China, ...	Gives tallow,
Acer Pseudoplatanus, ...	Austria, Italy, ...	Timber.
,, Opalus, W.	Italy, ...	Very ornamental,
,, plataniodes, W.	Europe, ...	Ornamental.
Æsculus Hippocastanea, ...	Asia, ...	Variously useful.
Tilia intermedia, Heque, ...	Britain, ...	} Linden or Lime trees, variously useful.
,, rubia, Dec.	Europe, ...	
Ilex Aquifolium, W.	Europe, ...	Ornamental, for hedges, &c.
,, dipyrena, Wab, ...	Himalyas, ...	Ditto.
Rhamnus infectoria, W.	S. Europe, ...	
,, alatus, W. ea.	Ditto, ...	Ornamental.
Olea Europea, W.	S. Europe, ...	Olive, said not to flourish far from the sea.
Ligustrum vulgare, W.	Europe, ...	The Privet, adapted for hedges.
Syringa vulgaris, W.	Persia, ...	} Ornamental Lilacs.
,, persica, W.	Ditto, ...	
Omus Europœa, P.S.	Italy, ...	Yields the Manna of commerce.
Fraxinus excelsus, W.	Europe, ...	Ash, variously useful.
Styrax Officinalis, W.	Italy, Levant, ...	Yields Storax.
Ceratonia Siliqua, W...	Levant, ...	Edible Seeds.
Robinia Pseudoacacia, W.	N. America, ...	Timber.
Ulex Coropœas, W.	Britain, ...	Furze, ornamental.
Cytisus Laburnum, W.	Switzerland, ...	Laburnum, ornamental.
,, Alpznus, Wen.	Europe, ...	Ditto, Timber.

Herbaceous Plants.

Botanical Names.	Native Country.	Uses.
Anchusa tinctoria, W....	S. Europe, ...	Yields a red dye.
Digitalis purpurea, S.	Europe, ...	Foxglove, medicinal.
Trifolium repens, W.	Europe, ...	Most valuable as an artificial grass, (Clover).
Hedysarum Onobryches, W.	Europe, ...	Saintfoin, an excellent artificial grass, may be tried on the glacis and slopes.
Liquoritia Officinalis, Monel, ...	S. ditto, ...	Yields the Liquorice of commerce.
Colchicum autumnalis, W.	Europe, ...	Medicinal,
Ipomea Jalapa, ...	Mexico, ...	Yields the Jalap, which requires a cool and dry climate.
Humulus Lupulus, ...	Europe, ...	Yields the Hop of commerce.

Several of the European fruits may also be introduced with benefit, such as currants, raspberries, strawberries.

Of vegetables, the artichoke, parsnip, carrot, turnip, potatoes, horse radish, celery, sea kale, asparagus, parsley, good lettuces, endive, are desiderata; some of them exist indigenously, but cultivated kinds are required.

For the more tropical parts of the country, I would recommend the introduction (or extension) of the Sissoo, Series, Jamin, the Mhowa, Toon, Mangoe, and Kikkur.

The list might be extended almost indefinitely. I have taken my authority for most of the plants adapted to the middle regions, by which may be meant all between 3,000 and 7,500 feet, from Loudon's Encyclopædia, which book is also my authority for the properties of the species. With regard to the North American plants, detailed information is required, the habitats given by Mr. Loudon embracing half of the new world.

Among these proposed introductions, the hop will be found. In a conversation with Dr. Falconer, it was suggested to me, that the Afghan climate, from its dry summer, would probably be well adapted to the cultivation of this plant. I in return suggested that the fine tracts between Mookloor and Ghuzni, the valleys about Cabul and Kohistan generally, would seem to be the most promising sites. I would not now omit Candahar. I think that with regard to climate, Afghanistan appears to present most, if not all, the circumstances under which the hop reaches perfection in England; and I also think, that the experiment should be tried. Mr. Loudon says, in his Encyclopædia of plants, that the expences of a hop plantation are very great. But I do not think that considerations of this kind, except where the expence is unreasonable, are to be taken into so much weight when connected with useful proposals recommended to a powerful Government. Even putting the question into the shape of pounds, shillings, and pence, great direct returns might be expected in the increased duration of life among the European soldiery in India, to say nothing of the enormous indirect advantage the army would derive from that increase of sobriety, likely to attend the substitution of good beer, for noxious ardent spirits. Excellent practical information regarding the hop is to be found in the Penny Cyclopædia, vol. xii. and I would

suggest, that the article alluded to, should dictate the line of operations, should the experiment be sanctioned by Government.

The same manure which in Flanders frequently ensures very large returns, will not be difficult to procure, and may with much greater cleanliness be used for the improvement of this plant, than in the baking of bread, or heating of baths.

Cochineal. I must not pass over a product of the animal kingdom, which though not indigenous to Afghanistan, is to Central Asia. I allude to the Cochineal, to which attention was first drawn by Sir A. Burnes, in his adventurous journey to Bokhara. This same distinguished officer obligingly furnished me with samples of the Asiatic product and that of America, derived from Russian commerce. He also sent me specimens of a leguminous shrub on which the insect is said to feed, and which is indigenous to Afghanistan. I could not detect any difference between the two articles, either in their appearance or the colour of their infusion. The subject is worth enquiring into; for my own part, I could not but apprehend that some mistake has occurred, and that the Asiatic insect, of whatever nature its colouring matter may be, will be found to differ in more material points from the American one.

Observations for Latitude from Mer. Altitudes of the Sun or Stars.

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	Remarks.
1839.							
March 2.	Bagh, ..	Sirius, ..	89°	25	29.810	65	
,, ,,	Ditto, ..	ε Canis Majoris, ..	64.30.10	25	,, ,,	,,	h. m.
,, ,,	Ditto, ..	⊙	107.23.40	40	29.848	10.5°	Assumed E. Long. 4-32.
,, 3	Ditto, ..	Sirius, ..	89.	,,	29.770	70	
,, ,,	Ditto, ..	ε Canis Majoris, ..	64.29.40	,,	,, ,,	,,	Mean Latitude 29°-1′-20″
,, 4	Ditto, ..	β Ursæ Minoris, ..	88.29.00	,,	29.800	55	
,, ,,	Mysoor, ..	Sirius, ..	88.41.20	20	29,700	70	
,, ,,	Ditto, ..	ε Canis Majoris, ..	64.11.15	,,	,, ,,	,,	h. m.
,, ,,	Ditto, ..	⊙	108.35.50	,,	29.807	10.0	Assumed Long. E. 4-32.
,, 5	Ditto, ..	Sirius, ..	88.41.15	,,	29.685	70	
,, ,,	Ditto, ..	ε Canis Majoris, ..	64.11.10	,,	,, ,,	,,	
,, 6	Ditto, ..	β Ursæ Minoris, ..	88.48,50	,,	29.700	65	
,, ,,	Nowshera, ..	Sirius, ..	88.18. 5	29.2	29,650	70	} Mean Lat. 29°-22′-15,″8.
,, ,,	Ditto, ..	ε Canis Majoris, ..	63.47.40	,,	,, ,,	,,	
,, ,,	Ditto, ..	⊙	108.59,50	,,	,, ,,	95	
,, 7	Ditto, ..	β Ursæ Minoris, ..	89.10.50	83	,, ,,	60	h. m.
,, ,,	Dadur, ..	⊙	109.33.40	,,	29,438	90	Assumed Long. E. 4-30.
,, 8	Ditto, ..	⊙	110.20.50	,,	29.372	,,	
,, 11	Ditto, ..	β Ursæ Minoris, ..	89.23.20	25	29.300	95	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	Remarks.
1839.							
March 11.	Dadur, ..	Antares, ..	68.58.10	25	29.300	95	
,, ,,	Drubhee Bolan Pass,	⊙	112.40.	,,	29,406	80	
,, 12	Drubhee Bolan Pass,	β Ursæ Minoris, ..	89.23.15	,,	,, ,,	60	
,, ,,	8 Miles into Bolan Pass, ..	⊙	113.28.25	20	29.210	85	
,, 13	Ditto, ..	Antares, ..	68.57.55	,,	29.200	56	
,, ,,	Ditto, ..	Saturn, ..	80.48.35	,,	,, ,,	,,	
,, ,,	Gurmab, ..	⊙	114. 1.45	,,	29.003	85	
,, 14	Ditto, ..	⊙	114.49.20	,,	28.995	,,	Cloudy.
,, 15	Ditto, ..	β Ursæ Minoris, ..	89.36.40	,,	29.000	60	
,, ,,	Ditto, ..	Antares, .	68.44.15	,,	,, ,,	,,	
,, ,,	Ditto, ..	Saturn, ..	80.34.40	20	,, ,,	,,	
,, 16	Bebee Nanee, ..	Antares, ..	68.31.30	,,	28.350	51	
,, ,,	Ditto, ..	Saturn, ..	80.22.45	,,	,, ,,	,,	
,, ,,	Abigoom, ..	⊙	115,56.50	,,	27.603	74	
,, ,,	Ditto, ..	*a* Hydræ, ..	104.29.50	,,	27.518	63	
,, 20	Munzil Dust-i-be,	Hydræ, ..	104.16.45	20.5	24.500	34	
,, ,,	Dowlut, ..	⊙	119.41.20	,,	,, ,,	62	
,, ,,	Ditto, ..	Hydræ, ..	104.16.35	40.8	,, ,,	46	
,, 24	Siriab, ..	Ditto, ..	103.54.45	,,	24.600	50	
,, 25	Quetta, ..	Ditto, ..	103.41.45	,,	24.700	48	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	Remarks.
1839.							h. m.
March 29.	Quetta, ..	Hydræ, ..	103.41.20	40.8	24.700	42	
„ 30	Ditto, ..	⊙	126. 9.25	„	0.720	75	Assumed Longitude 4-15.
„ „	Ditto, ..	*a* Hydræ, ..	103.41.30	„	0.700	46	
„ 30	Ditto, ...	Dubhe, ...	115,14,00	„	„ „	42	
„ 31	Ditto, ...	⊙	127.18.56	41	„ „	85	Doubtful observation.
April 2d.	Ditto, ...	*a* Hydræ, ...	103.14.30	40.8	0.730	55	Mean Latitude.
„ „	Ditto, ...	⊙	128.28.30	„	„ „	85	Quetta, 30° 12′ 52″ 8.
„ „	Ditto, ...	Dubhe, ...	115.13.45	„	„ „	57	
„ 6	Ditto, ...	Ditto, ...	115.14.50	„	„ „	46	
„ 8	Hydrozye, ...	*a* Hydræ, ...	103. 9.	„	25.100	61	Hurried observation.
„ „	Ditto, ...	Dubhe, ...	115.46.45	43	„ „	58	
„ 9	Hykulzye, ...	Hydræ, ...	102.52.20	„	25.200	55	
„ „	Ditto, ...	Dubhe, ..	116. 3.10	„	„ „	50	
„ 10	Berumbye, ...	*a* Hydræ, ...	102.40.55	„	24.700	65	
„ 11	Kojhuck Pass, ...	*a* Hydræ, ...	102.25.35	„	23.600	60	
„ „	Ditto, ...	*a* Hydræ, ...	116.29.30	„	„ „	55	
„ 13	Choky, ...	Ditto, ...	116.31.20	31	24.720	55	
„ 14	Ditto, ...	Ditto, ...	116.31.50	„	„ „	66	
„ 20	Dundi Goollai, ...	*a* Hydræ, ...	102. 9.45	„	26.200	75	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	Remarks.
1839.							
April 21	Kila Putoola, ...	Dubhe, ..	116.27.40	31	26.200	75	Doubtful.
„ 24	Dai Haj, ...	Dubhe, ...	117.37.33	40	26.500	80	
„ 28	Candahar, ...	Dubhe, ...	118. 0.50	1.27	26.550	70	
„ „	Ditto, ...	β Corvi, ...	71.52.55	„	„ „	„	
„ 30	Ditto, ...	Dubhe, ..	117.58.40	„	26.600	75	Hurried observation.
„ „	Ditto, ...	β Corvi, ...	71.52.00	„	„ „	70	
„ „	Ditto, ..	Jupiter, ...	111.17.00	„	„ „	„	
„ „	Ditto, ..	Spica, ...	96.13.25	„	„ „	„	
May 2nd.	Ditto, ...	Dubhe, ..	118. 0.10	1.17	26.660	75	
„ „	Ditto, ...	β Corvi, ...	71.22.25	„	0.650	„	
„ „	Ditto, ...	Jupiter, ...	111.25.10	„	„ „	„	
„ „	Ditto, ...	Spica, ...	96.14.20	1.175	26.650	72	
„ 3	Ditto, ...	β Corvi, ...	71.53.30	„	„ „	78	
„ „	Ditto, ...	Jupiter, ...	111.30.00	„	„ „	„	
„ „	Ditto, ...	Spica, ...	96.14.40	„	„ „	75	
„ 5	Ditto, ...	β Corvi, ...	71.52.40	„	„ „	„	
„ „	Ditto, ..	Jupiter, ...	111.37.30	„	„ „	72	
„ „	Ditto, ...	Spica, ...	96.14.10	„	„ „	70	
„ 15	Ditto, ...	... ...	96.15.00	12.8	„ „	75	
June 3	Ditto, ..	β Ursæ Minoris, ...	93.37.25	1.31.6	„ „	80	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	Remarks.
1839.							
June 3	Candahar, ..	β Libræ, ...	99.19.55	1.9	26.650	80	
„ 10	Ditto, ...	α Libræ, ...	86. 8.45	„	„ „	70	Hurried observation.
„ „	Ditto, ...	β Ursæ Minoris, ...	93.37.45	„	„ „	70	
„ 11	Ditto, ...	α Libræ, ...	86. 8.30	1.19.2	„ „	70	
„ „	Ditto, ...	β Ursæ Minoris, ...	93.37.30	„	„ „	„	
„ „	Ditto, ...	βLibræ, ...	99.19.25	„	„ „	„	
„ 12	Ditto, ...	β Libræ, ...	86. 9.00	„	„ „	64	
„ „	Ditto, ...	α Ursæ Minoris, ...	93,37.10	„	„ „	„	
„ „	Ditto, ...	β Libræ, ..	99.18.50	„	„ „	„	Mean Latitude.
„ 13	Ditto, ...	α Libræ, ..	86. 9.00	„	„ „	70	Candahar, 31°35″19″.
„ „	Ditto, ...	β Ursæ Minoris, ..	93.36.00	„	„ „	„	
„ „	Ditto, ...	β Libræ, ...	99.18.10	„	„ „	„	
„ 15	Ditto, ...	β Ursæ Minoris, ...	93.37.40	„	„ „	62	
„ „	Ditto, ...	β Libræ, ..	99.18.40	„	„ „	62	
„ 16	Ditto, ...	α Libræ ...	86. 8.50	1.25	„ „	„	
„ 17	Ditto, ...	β Ursæ Minoris, ..	93.37.00	„	„ „	70	
„ „	Ditto, ...	β Libræ, ...	99,18.50	„	„ „	„	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	Remarks.
1839.							
June 17	Candahar, ...	α Libræ, ...	86. 8.25	1.25	26.650	70	
„ 18	Ditto, ...	β Ursæ Minoris, ...	93.37.30	„	„ „	„	
„ „	Ditto, ...	β Libræ, ...	99.18.25	„	„ „	„	
„ „	Ditto, ...	β Libræ, ..	86. 8.00	„	„ „	„	
„ 19	Ditto, ...	β Ursæ Minoris, ...	93.36.30	„	„ „	80	Hot Westerly winds.
„ „	Ditto, ...	α Libræ, ..	99.18.45	„	„ „	„	
„ „	Ditto, ...	β Libræ, ...	86. 7.50	„	„ „	„	
„ „	Ditto, ...	β Scorpii, ...	78. 9.40	„	„ „	„	
„ „	Ditto, ...	Antares, ...	64.45.20	„	„ „	„	
„ 20	Ditto, ...	β Scorpii, ...	78. 9.30	„	„ „	„	
„ 22	Ditto, ...	... ..	78. 9.30	„	„ „	„	
„ „	Ditto, ...	β Draconis, ...	119.28.20	„	„ „	„	
„ „	Ditto, ...	β Cephei, ...	103.31.45	„	„ „	72	
„ 23	Ditto, ...	Draconis, ...	119.28.50	„	„ „	78	
„ 24	Ditto, ...	β Cephei, ...	103.32.45	„	„ „	„	
„ „	Ditto, ...	α Cephei, ...	119.25.20	„	„ „	70	
„ 28	Kolah-i-Azeem, ...	β Libræ, ...	99.10.25	1.5	26.240	85	
„ „	... ...	β Ursæ Minoris, ...	93.44.40	„	„ „	„	Hurried observation.

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitudes.	Error.	Barometer.	Therm.	Remarks.
1839.							
June 29	Turnukur. Khail-i-Akhoon. ...	β Ursæ Minoris, ...	93.53.00	1.5	25.858	80	
,, ,,	... ...	β Libræ, ...	99. 2.35	,,	,, ,,	,,	
,, 30	Shair-i-Suffa, ...	β Ursæ Minoris, ...	94. 2.30	,,	25.668	,,	
,, ,,	... ...	β Libræ, ...	98.52.30	,,	,, ,,	,,	
July 1st.	Near Tirandaz, ...	β Ursæ Minoris, ...	94. 9.40	,,	25.500	80	
,, ,,	.. ..	β Libræ, ...	98.45.20	,,	,, ,,	,,	
,, 2	Toot, ...	β Ursæ Minoris, ...	94.18.40	,,	25.300 assd.	80	
,, ,,	.. ..	β Libræ, ..	28.36.40	,,	,, ,,	,,	
,, 4	Kholah-i-Giljee, ...	β Scorpionis, ...	77. 5.45	,,	24.700	75	
,, ,,	... ...	β Draconis, ..	120.33.30	1.0	,, ,,	,,	Indifferent.
,, 5	.. ..	β Libræ, ..	98.14.00	,,	,, ,,	80	Mean Latitude.
,, ,,	β ...	β Scorpii, ...	77. 5.10	,,	,, ,,	78	Kelat-i-Ghilzie.
,, ,,	... .	β Draconis, ...	120.32.10	,,	,, ,,	76	32° 7′ 24″
,, ,,	... ...	δ Ophiuchi, ...	109.14.50	,,	,, ,,	,,	
,, 6	Sir-i-Asp, ...	β Scorpii, ...	76.55.50	,,	24.500	70	
,, ,,	... ...	δ Ophiuchi, ...	109. 5.35	,,	,, ,,	,,	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Latitude.	Error.	Barometer.	Therm.	Remarks.
1839.							
July 6	Sir-i-Asp, ..	β Draconis, ..	120.42.40	1.0	24.500	70	
„ 9	Shuftul, ..	.. .. ..	121. 9.20	„	24.050	75	
„ „	.. .. ..	δ Ophiuchii, ..	108.40.00	„	„ „	„	
„ 11	Chushni Sair, ..	β Scorpii, ..	76.17.10	„	23.950	75	Cloudy.
„ „	.. .. ..	Antares, ..	62.52.20	„	„ „	„	bright.
„ „	.. .. ..	δ Ophiuchi, ..	108.27.20	„	„ „	„	rather cloudy.
„ 12	Ghojan, ..	β Draconis, ..	121.46.00	53.7	23.600	73	very windy.
„ „	.. ..	δ Ophiuchi, ..	108. 1,35	„	„ „	„	„
„ 13	Mookloor, ..	.. .. ..	107.47.50	„	23,570	70	Hurried.
„ 14	.. .. ..	β Draconis, ..	122.00.00	„	„ „	„	Mean Latitude.
„ „	.. .. ..	β Scorpii, ..	75.37.30	„	„ „	73	Mookloor,
„ „	.. ..	δ Ophiuchi, ..	107.46.50	„	„ „	„	30° 51′ 27.″
„ 15	.. .. ..	β Draconis, ..	121.59.50	„	„ „	„	
„ 16	Oba, ..	δ Ophiuchi, ..	107.29.00	„	23.400	70	
„ „	.. .. ..	β Draconis, ..	122.19.45	„	„ „	„	
„ 17	Jumrat, ..	β Scorpii, ..	75. 4.00	1.	23.300	75	
„ „	.. .. ..	Saturn, ..	75.27.35	„	„ „	„	
„ 18	Near Karabagh, ..	δ Ophiuchi, ..	107. 3.00	„	23.435	71	Cloudy and hazy.

Observations for Latitude from Mer. Altitude of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Latitude.	Error.	Barometer.	Therm.	Remarks.
1839.							
July 18	Near Karabagh, ..	β Draconis, ..	122.45.10	1.9	23.435	71	
,, 20	Nanee Mills, ..	β Scorpii, ..	74.31.00	,,	23.336	76	
,, ,,	.. .. ..	δ Ophiuchi, ..	106.41 30	,,	,, ,,	,,	
,, ,,	.. .. ..	β Draconis, ..	123. 5.40	,,	,, ,,	,,	
,, 25	Ghuzni, ..	ξ Cephei, ..	93.43.20	1.18	23.000	63	
,, 26	.. .. ..	β Draconis, ..	123.25.45	1.42	,, ,,	75	
,, ,,	.. .. ..	Saturn, ..	74.37.00	,,	,, ,,	,,	Mean Latitude Ghuzni, 33° 34′ 27″
,, 27	.. .. ..	α Cephei, ..	123.23.10	,,	,, ,,	66	
,, ,,	.. .. ..	β Cephei, ..	107.29.20	,,	,, ,,	,,	
,, ,,	.. .. ..	Saturn, ..	74.37.00	,,	,, ,,	78	
Aug. 1st.	Hyder Khail, ..	Fomathaut, ..	51.12.35	1.7	23.160	60	Observations thus far made with a Gilbert's sextant, 6 inches radius, of his usual workmanship.
,, ,,	.. .. ..	β Cephei, ..	94.32.15	,,	,, ,,	,,	
,, 2	Shaikabad, ..	δ Aquilæ, .	117.27.40	,,	23.360	73	
,, ,,	.. .. ..	α Aquilæ, ..	128.45.10	,,	,, ,,	,,	
,, ,,	.. .. ..	α Capriconi, ..	85.49.25	,,	,, ,,	,,	
,, 11	Cabul, ..	δ Aquilæ, .	116.37.20	32	24.200	75	
,, 11	Baber's Tomb, ..	α Aquilæ, ..	127.54.30	,,	,, ,,	,,	Observations from this made with a well furnished 6 ins. radius sextant of Troughton and Simons,
,, 13	.. .. ..	α Cephei, ..	125.12.40	,,	,, ,,	70	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	Remarks.
1839.							
Aug. 13	Baber's Tomb, ..	β Aquarii, ..	98.26.40	32	24.200	70	} Hurried Observations.
,, ,,	.. .. ..	β Cephei, ..	109.18.45	,,	,, ,,	,,	
,, ,,	.. .. ..	ε Pegasi, ..	129.16.35	,,	,, ,,	,,	Both instruments were divided to 10″
,, ,,	.. .. ..	α Aquarii, ..	108.48.55	,,	,, ,,	,,	
,, 15	.. .. ..	α Cephei, ..	125.12.40	27.7	,, ,,	65	
,, ,,	.. .. ..	β Aquarii, ..	98.28.10	,,	,, ,,	,,	
,, ,,	.. .. ..	β Cephei, ..	109.21.25	1.15	,, ,,	,,	Gilbert's Sextant.
,, ,,	.. .. ..	ε Pegasi, ..	129.16.55	27.7	,, ,,	,,	
,, ,,	.. .. ..	α Aquarii, ..	108.49.00	,,	,, ,,	,,	
,, 17	.. .. ..	α Cephei, ..	125.13.00	,,	,, ,,	,,	
,, ,,	.. .. ..	β Cephei, ..	109.19.10	,,	,, ,,	,,	
,, ,,	.. .. ..	ε Pegasi, ..	129.17.15	,,	,, ,,	,,	
,, ,,	.. .. ..	α Aquarii, ..	108.49.00	,,	,, ,,	,,	
,, 8	.. .. ..	.. .. ..	108.49.10	18	,, ,,	,,	
,, ,,	.. .. ..	α Cephei, ..	125.12.30	,,	,, ,,	,,	
,, ,,	.. .. ..	δ Pegasi, ..	130.59.40	,,	,, ,,	,,	
,, ,,	.. .. ..	Fomathaut, ..	50. 7.00	,,	,, ,,	63	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	Remarks.
1839.							
Aug. 19	Baber's Tomb, ..	δ Aquilæ, ..	116.36.20	43.3	24.200	70	
„ „	.. .. ..	α Aquilæ, ..	127.54.20	„	„ „	75	
„ 20	.. .. ..	β Ceti, ..	73.17.55	„	„ „	73	
„ „	.. .. ..	β Cephei, ..	109.19.15	18	„ „	65	
„ „	.. .. ..	ε Pegasi, ..	129.17.20	„	„ „	„	
„ „	.. .. ..	Polaris, ...	72. 9.10	„	„ „	58	
„ „	.. .. ..	Ceti, ..	93. 0.10	„	„ „	58	
„ 21	.. .. ..	α Aquilæ, ..	127.54.15	„	„ „	70	
„ „	.. .. ..	δ Aquilæ, ..	116.36.30	„	„ „	„	
„ 28	Yourtt, ..	α Aquilæ, ..	187.58.40	27	20.8.30	48	
„ „	.. .. ..	⊙ ..	129.45.30	„	„ „	70	Long. Assd. 4h. 33m. 20s. E.
„ 29	.. .. ..	δ Aquilæ, ..	116.41. 5	„	20.826	48	
„ „	.. .. ..	α Aquilæ, ..	127.58.40	„	„ „	„	
„ „	Siah Sung, ..	δ Aquilæ, ..	116.27.30	„	20. 9	44	
„ „	. .. ..	α Aquilæ, ..	127.45.35	„	„ „	„	
„ 31	Kaloo, ..	δ Aquilæ, ..	116.18.30	„	20. 6	44	
„ „	.. .. ..	α Aquilæ, ..	127.36.10	„	„ „	„	

Observations of Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	Remarks.
1839.							
Sept. 1	Sooktah, ..	δ Aquilæ, ..	116.12.20	30	21.410	50	
,, ,,	.. .. ..	α Aquilæ, ..	127.30.30	30	,, ,,	,,	
,, 2	Topchee, ..	δ Aquilæ, ..	116. 4.15	40	22 000	56	
,, ,,	.. .. ..	α Aquilæ, ..	127.21.40	,,	,, ,,	,,	
,, 3	Bamean, ..	δ Aquilæ, ..	115.57.55	33	22.830	50	
,, ,,	.. .. ..	α Cephei, ..	125.51.20	,,	,, ,,	46	
,, ,,	.. .. ..	β Aquarii, ..	97.49.40	,,	,, ,,	,,	
,, ,,	.. .. ..	ε Pegasi, ..	128.38.50	,,	,, ,,	,,	
,, ,,	.. .. ..	α Aquarii, ..	108.11.10	,,	,, ,,	,,	
,, 4	.. .. ..	⊙	124.41.40	,,	22.460	100	Long. Asd. 4h. 33m. E.
,, ,,	.. .. ..	δ Aquilæ, ..	115.57.50	,,	,, ,,	50	
,, ,,	.. .. ..	α Aquilæ, ..	127.16.00	,,	,, ,,	,,	
,, ,,	.. .. ..	α Cephei, ..	125.51.00	,,	,, ,,	46	Mean Lat.
,, ,,	.. .. ..	β Aquarii, ..	97.50.00	,,	,, ,,	,,	Bameean 36° 49′ 11″.
,, ,,	.. .. ..	ε Pegasi, ..	128.39 30	,,	,, ,,	,,	
,, ,,	.. .. ..	α Aquarii, ..	108.11.30	,,	,, ,,	,,	
,, ,,	.. .. ..	⊙	123.57.30	,,	,, ,,	100	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	Remarks.
1839.							
Sept. 6	Trohawk, ..	δ Aquilæ, ..	115.58.10	33	22. 7	58	
„ „	.. .. ..	α Aquilæ, ..	127.15.40	„	„ „	„	
„ 7	Erak, ..	⊙	122.28.40	31	22.130	96	
„ 9	Kurzad, ..	δ Aquilæ, ..	116.19.15	„	20. 57	42	
„ „	.. .. ..	α Aquilæ, ..	127.36.50	„	„ „	„	Cloudy.
„ 10	Girdun Dewar, ..	⊙	120.51.00	32	21. 2	90	
„ 12	Ciri Chushon, ..	δ Aquilæ, ..	116.44.40	„	22. 2	54	
„ „	.. .. ..	α Aquilæ, ..	128. 2.35	„	„ „	„	
„ 13	Jubraz, ..	⊙	118.38.10	„	22.760	98	
„ 14	Kote-i-Ashruf, ..	⊙	117.55.20	„	23.109	„	
„ 15	Urghundi, ..	⊙	117. 6.20	„	23. 26	100	
„ „	.. .. ..	δ Aquilæ, ..	116.40.25	„	„ „	65	
„ „	.. .. ..	α Aquilæ, ..	127.58.20	„	„ „	„	
„ 16	Topchee Bashee, ..	δ Aquilæ, ..	116.36.40	„	23.	„	
„ „	.. .. ..	α Aquilæ, ..	127.54.35	„	„ „	„	
„ 20	Cabul, ..	α Cephei, ..	125.13.10	27	24. 14	65	
„ „	E. side in Camp, ..	α Aquarii, ..	108.49.40	„	„ „	„	
„ 21	.. .. ..	⊙	112.23.20	„	„ „	100	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed, Latitude.	Error.	Barometer.	Therm.	Remarks.
1839.							
Sept. 21	E. side in Camp, ..	α Aquilæ, ..	127.54.10	27	24. 14	65	
,, ,,	.. .. ..	α Cephei, ..	125.13. 5	,,	,, ,,	,,	
,, ,,	.. .. ..	β Cephei, ..	109.19.35	,,	,, ,,	60	
,, ,,	.. .. ..	ε Pegasi, ..	129.17.25	,,	,, ,,	,,	
,, 22	.. .. ..	⊙	111.35.50	30	,, ,,	98	
,, 23	Cabul, ..	⊙	110.49.20	,,	,, ,,	,,	
,, 24	.. .. ..	⊙	110. 2.45	,,	,, ,,	,,	
,, 25	.. .. ..	⊙	109.16.00	,,	24. 24	,,	
,, 28	.. .. ..	⊙	106.54.55	,,	24. 14	,,	
,, 30	.. .. ..	⊙	105.21.45	18.7	24.300	,,	
Oct. 1.	.. .. ..	⊙	104.34.40	,,	,, ,,	105	
,, 2	.. .. ..	⊙	103.48.15	,,	24.316	,,	
,, 3	.. .. ..	⊙	103. 2.00	,,	24. 35	,,	
,, 5	.. .. ..	Rigel, ..	94.15.00	,,	,, ,,	40	
,, ,,	.. .. ..	ε Orionis, ..	108.24.60	,,	,, ,,	,,	
,, ,,	.. .. ..	Betelgeux, ..	125.45.35	,,	,, ,,	,,	
,, ,,	.. .. ..	⊙	101.29.00	,,	,, ,,	110	
,, 6	Bootkhah, ..	⊙	100.42.50	,,	24. 3	105	
,, 7	Khoosd Cabul, ..	⊙	100. 9.25	,,	23.293	90	
,, 8	Taizeen, ..	⊙	99.22.00	13	24. 05	,,	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Latitude.	Error.	Barometer.	Therm.	Remarks.
1839.							
Oct. 8.	Taizeen, ..	α Cephei, ..	125. 1.30	13	24.05	45	
,, ,,	.. .. ..	β Aquarii, ..	98.40.25	,,	,, ,,	,,	
,, ,,	.. .. ..	ϵ Pegasi, ..	129.29.40	,,	,, ,,	,,	
,, ,,	.. .. ..	α Aquarii, .	109. 1.20	,,	,, ,,	,,	
,, 9	.. .. ..	⊙	98.36.40	,,	,, ,,	90	
,, ,,	... .	α Cephei, ..	125.00.00	,,	,, ,,	45	
,, ,,	.. .. ..	β Aquarii, ..	98.40.10	,,	,, ,,	,,	
,, ,,	.. .. ..	ϵ Pegasi, ..	129.29.40	,,	,, ,,	46	
,, ,,	.. .. ..	α Aquarii, ..	109. 1.15	,,	,, ,,	,,	
,, 10	Barikab, ..	⊙	97.37.45	27	25. 1	100	
,, ,,	.. .. ..	α Cephei, ..	125.13.00	,,	,, ,,	58	
,, ,,	.. .. ..	β Aquarii, ..	98.27.20	,,	,, ,,	,,	
,, ,,	.. .. ..	ϵ Pegasi, ..	129.16.45	,,	,, ,,	,,	
,, ,,	.. .. ..	α Aquarii, ..	108.48.25	,,	,, ,,	,,	
,, 11	Jugdulluck, ..	⊙	97. 1.20	20	25.04	90	
,, ,,	.. . ..	ϵ Pegasi, ..	129.25.50	,,	,, ,,	58	Mean Lat.
,, 12	.. .. ..	c ⊙	96.16.00	16	25.100	90	Jugdulluck, 34° 26′ 24″.8.

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	Remarks.
1839.							
Oct. 12	Jugdulluck, ..	α Cephei, ..	125. 4.10	16	25.100	60	
,, ,,	.. .. ..	β Cephei, ..	109.10.40	,,	,, ,,	,,	
,, ,,	.. .. ..	β Pegasi, ..	129.25.40	,,	,, ,,	,,	
,, 13	Soorkhab, ..	β Aquarii, ..	98.48.20	,,	25. 9	60	
,, ,,	.. .. ..	α Cephei, ..	124.53.10	,,	,, ,,	,,	
,, ,,	.. .. ..	ε Pegasi, ..	129.37.00	,,	,, ,,	,,	
,, ,,	.. .. ..	α Aquarii, ..	109. 8.50	,,	,, ,,	,,	
,, 14	Gundamuck, ..	⊙	95. 3.45	22	25. 7	100	Mean Lat.
,, ,,	.. .. ..	α Cephei, ..	124.46.45	,,	,, ,,	56	Gundamuck 34° 17′ 36″.8.
,, ,,	.. .. ..	β Cephei, ..	108.53.20	,,	" "	,,	
,, ,,	.. .. ..	ε Pegasi, ..	129.43.00	,,	,, ,,	,,	
,, ,,	.. .. ..	α Aquarii, ..	109.15.25	,,	,, ,,	,,	
,, 16	Futtehabad, ..	⊙	93.27.00	18	27. 05	106	Long. Assd. 4h. 41m. E.
,, ,,	.. .. ..	α Cephei, ..	124.53.30	,,	,, ,,	52	
,, ,,	.. .. ..	β Cephei, ..	109. 0.30	,,	,, ,,	,,	
,, ,,	.. .. ..	ε Pegasi, ..	129.36.00	,,	,, ,,	,,	
,, ,,	.. .. ..	α Aquarii, ..	109. 7.50	,,	,, ,,	,,	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	Remarks.
1839.							
Oct. 17	Futtehabad, ..	⊙	92.42.50	15	27.106	96	
,, 18	.. .. ..	α Cephei, ..	124.53.40	,,	,, ,,	58	
,, ,,	.. .. ..	β Cephei, ..	109. 0.15	,,	,, ,,	,,	
,, ,,	.. .. ..	ε Pegasi, ..	129.36.00	,,	,, ,,	56	
,, ,,	.. .. ..	α Aquarii, ..	109. 8.00	,,	,, ,,	,,	
,, 19	.. .. ..	⊙	91.15. 5	,,	27. 17	85	
,, 20	Sultanpore, ..	⊙	90.24.40	54.2	27. 96	98	
,, ,,	.. .. ..	α Cephei, ..	124.59.25	44+	,, ,,	58	
,, ,,	.. .. ..	β Cephei, ..	109. 6.20	,,	,, ,,	,,	
,, ,,	.. .. ..	ε Pegasi, ..	129.28.20	,,	,, ,,	,,	
,, 21	Julalabad, ..	⊙	89.39.15	28.5+	28. 2	104	
,, ,,	.. .. ..	α Cephei, ..	125. 1.15	,,	,, ,,	56	
,, ,,	.. .. ..	β Cephei, ..	109. 8.00	,,	,, ,,	,,	
,, ,,	.. .. ..	ε Pegasi, ..	129.26.20	,,	,, ,,	,,	
,, 22	.. .. ..	Rigel, ..	94.23.50	,,	,, ,,	48	
,, ,,	.. .. ..	Betelgeux, ..	125.54.15	,,	,, ,,	,,	
,, ,,	.. .. ..	Sirius, ..	78.11.40	,,	,, ,,	44	
,, ,,	.. .. ..	⊙	88.55.50	47.5+	28. 15	106	
,, ,,	.. .. ..	α Aquarii, ..	108.57.50	,,	,, ,,	60	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	Remarks.
1839.							
Oct. 22.	Jelalabad, ..	Fomalhaut, ..	50.16.00	47.5+	28. 15	60	
„ 23	.. .. ..	⊙	88.13.55	45+	28.211	106	Mean Lat.
„ „	.. .. ..	α Aquarii, ..	108.58.35	„	„ „	56	Jelalabad, 34° 25′ 5″
„ „	.. .. ..	ξ Pegasi, ..	131. 9.30	„	„ „	„	
„ „	.. .. ..	Fomalhaut, ..	50.16.00	„	„ „	„	
„ 24	.. .. ..	⊙	87.31.00	54+	„ „	110	
„ 25	.. .. ..	⊙	86.49.40	50+	28. 2	107	
„ „	.. .. ..	β Cephei, ..	109. 7.20	„	„ „	60	
„ „	.. .. ..	α Aquarii, ..	108.57.30	„	„ „	„	
„ 26	.. .. ..	Rigel, ..	94.23.40	„	„ „	45	
„ „	.. .. ..	ε Orionis, ..	108.33.00	„	„ „	„	
„ „	.. .. ..	Belelgeux, ..	125.54.15	„	„ „	„	
„ „	.. .. ..	Sirius, ..	78.11.20	„	„ „	„	
„ „	.. .. ..	Procyon, ..	122.25.30	„	„ „	„	
„ „	.. .. ..	⊙	86. 8.00	51+	„ „	120	
„ 27	Ali Baghan, ..	⊙	85.33.10	48.5+	„ „	110	
„ „	.. .. ..	α Cephei, ..	124.55.20	„	„ „	68	
„ „	.. .. ..	β Aquarii, ..	98.42.50	„	„ „	78	
„ „	.. .. ..	ε Pegasi, ..	129.32.10	„	„ „	„	
„ „	.. .. ..	α Aquarii, ..	109. 3.40	„	„ „	„	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitudes.	Error.	Barometer.	Therm.	Remarks.
1839.							
Oct. 28.	Barikab, ..	⊙	84.58.40	30. +	28. 36	105	
„ 29	North Chardeh, Bussoollah, ..	⊙	84.26.30	50. +	28. 63	105	
„ „	.. .. ..	ε Pegasi, ..	129.46.30	„	„ „	62	
„ „	.. .. ..	α Aquarii, ..	109.18.10	„	„ „	„	
„ 30	Lalpore, ..	⊙	83.50.30	33. +	28. 75	103	
„ „	.. .. ..	α Aquarii, ..	109.21.10	„	„ „	65	Mean Lat.
„ „	.. .. ..	ξ Pegasi, ..	131.32.30	„	„ „	„	Lalpore, 34° 13′ 25″
„ „	.. .. ..	Fomalhaut, ..	50.39.00	„	„ „	„	
„ 31	.. .. ..	⊙	83.10.10	45. +	28. 73	109	
„ „	.. .. ..	α Aquarii, ..	109.22.00	„	„ „	65	
„ „	.. .. ..	ξ Pegasi, ..	131.32.40	„	„ „	„	
„ „	.. .. ..	Fomalhaut, ..	50.39.50	„	„ „	„	
Nov. 1.	Lundye Khanal, ..	⊙	82.45.10	42. +	27. 67	93	
„ „	.. .. ..	ξ Pegasi, ..	130. 3.10	„	„ „	60	
„ „	.. .. ..	α Aquarii, ..	109.35.20	„	„ „	62	
„ 2	.. .. ..	⊙	82. 6.25	40. +	„ „	90	
„ „	.. .. ..	α Aquarii, ..	109.35.25	„	„ „	62	
„ 4	Ali Musjeed, ..	⊙	81. 2.20	„	27. 70	90	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	Remarks.
1839.							
Nov. 5	Mouth of Khyber,	ξ Pegasi,	132. 2.00	40. +	28. 4	64	
,, ,,	.. .. ..	Fomalhaut,	51. 9. 5	,,	,, ,,	,,	
,, 7	Peshawur,	⊙	79.14.00	,,	29. 1	90	
,, 8	.. .. ..	ξ Pegasi,	131.59.10	35. +	,, ,,	60	
,, ,,	.. .. ..	Fomalhaut,	51. 6.15	,,	,, ,,	,,	
,, ,,	.. .. ..	Sirius,	79. 1.40	,,	,, ,,	50	Mean Lat.
,, ,,	.. .. ..	Procyon,	123.15.30	,,	,, ,,	,,	Peshawur, 34° 00′ 5″
,, 9	.. .. ..	⊙	78. 3.50	,,	,, ,,	90	
,, 11	.. .. ..	⊙	76.55.25	43. +	,, ,,	,,	
,, ,,	.. .. ..	ξ Pegasi,	131.59.25	,,	,, ,,	59	
,, ,,	.. .. ..	Fomalhaut,	56. 6.20	,,	,, ,,	,,	
,, 12	.. .. ..	⊙	76.22.25	50. +	,, ,,	90	
,, 13	.. .. ..	⊙	75.49.25	47. +	,, ,,	98	
,, 14	.. .. ..	⊙	75.17.30	50. +	,, ,,	10	
,, 15	.. .. ..	⊙	74.45.50	,,	,, ,,	,,	
,, 16	.. .. ..	⊙	74.15.30	48.8+	,, ,,	98	
1840.	Bussoat, ...	Rigel, ..	94.16.30	41.6+	28. 5	33	
Jan. 11	Near Julalabad, ..	ε Orionis, ..	108.25.50	,,	,, ,,	,,	
,, ,,	.. .. ..	Belelgeux, ..	125.46.50	,,	,, ,,	,,	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	Remarks.
1840.							
Jany. 12	Shaiwa, ...	Rigel, ..	94. 5.20	41.6+	28. 22	40	
,, ,,	.. .. ..	Belelgeux, ..	125.36.00	,,	,, ,,	,,	
,, 13	.. .. ..	⊙	67. 6.00	,,	,, ,,	73	
,, 17	Pushut, ...	Rigel, ..	93.47.50	,,	27. 62	38	
,, ,,	Camp, ...	ε Orionis, ..	107.57.10	,,	,, ,,	,,	
,, ,,	.. .. ..	Belelgeux, ..	125.18.25	,,	,, ,,	,,	
,, 25	Rushut Fort, ..	ξ Eridani, ..	82.38.10	,,	,, ,,	37	
,, ,,	.. .. ..	Rigel, ..	93.46.40	,,	,, ,,	,,	
,, ,,	.. .. ..	ε Orionis, ..	107.56.10	,,	,, ,,	42°	
,, ,,	.. .. ..	Belelguex, ..	125.17.10	,,	,, ,,	,,	
,, 29	.. .. ..	⊙	73.44.40	45. +	,, ,,	75	h. m. s. Long. Assd. 4. 43.20. E.
,, 30	.. .. ..	Rigel, ..	93.46.50	,,	,, ,,	42	
,, ,,	.. .. ..	ε Orionis, ..	107.56.15	,,	,, ,,	,,	
,, ,,	.. .. ..	Belelguex, ..	125.17.30	,,	,, ,,	,,	
Feby. 1.	.. .. ..	ε Eridani, ..	82.38.00	,,	,, ,,	,,	
,, 2	.. .. ..	⊙	75.56.40	37. +	,, ,,	71	
,, 8	.. .. ..	⊙	79.31.45	50. +	,, ,,	72	
March 2	Chugar Serai, ..	Sirius, ..	77.17.20	53. +	27. 45	63	On roof of house only
,, ,,	.. .. ..	Procyon, ..	121.31.30	42. +	,, ,,	60	tremulous.
,, 4	Otipore, ...	ε Orionis, ..	107.34.00	,,	27. 25	,,	Good

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	Remarks.
1840.							
March 4	Olipore, ..	Belelgeux, ..	124.54.50	53+	27.25	60	
,, ,,	.. .. ..	Sirius, ..	77.11.10	,,	,, ,,	,,	Mean Lat.
,, ,,	.. .. ..	Procyon, ..	121.26.10	,,	,, ,,	,,	Olipore.
,, 7	.. .. ..	.. .. ..	121.26.10	,,	,, ,,	50	34° 54′ 38″.
,, 9	.. .. ..	Sirius, ..	77.11.30	35+	,, ,,	,,	
,, ,,	.. .. ..	⊙	100.48.20	,,	,, ,,	85	Cloudy.
,, 14	.. .. ..	⊙	104.44.10	31+	,, ,,	100	Assd. Long. 4h. 43m. E.
,, ,,	.. .. ..	Sirius, ..	77.11.40	,,	,, ,,	58	
,, ,,	.. .. ..	Procyon, ..	121.26.00	,,	,, ,,	,,	
,, ,,	.. .. ..	*a* Hydræ, ..	94.14.30	,,	,, ,,	,,	
,, 15	.. .. ..	⊙	105.31.30	42 .5+	,, ,,	97	
,, 17	Chugar Serai, ..	Sirius, ..	77.17.10	,,	,, ,,	58	Cloudy.
,, ,,	.. .. ..	*a* Hydræ, ..	94.20.40	,,	,, ,,	63	Mean Lat.
,, ,,	.. .. ..	Regulus, ..	133.44.50	,,	,, ,,	61	Chugar Serai.
,, 22	Pushut Fort, ..	⊙	111.25.10	56+	27.62	98	34° 51′ 43″ 7.
,, 23	.. .. ..	⊙	112.13.10	,,	,, ,,	90	
,, 27	.. .. ..	⊙	115.21.15	29+	,, ,,	80	
,, 28	Koonur, ...	Procyon, ..	122. 0. 0	,,	27.800	55	Mean Lat.
,, ,,	.. .. ..	*a* Hydræ, ..	94.49.10	,,	,, ,,	52	Koonur.
,, ,,	.. .. ..	Regulus, ..	136.14.00	,,	,, ,,	,,	34° 37′ 37″
,, 29	.. .. ..	⊙	117. 6.20	,,	,, ,,	88	

Observations for Azimuth.

Date.	Station.	Time.	Observed Altitude	Bearing.	
1840.					
April 3	Pushut Fort, .	10. 1.20 A. M.	50.47.43	131.57. 6. 6	
„ 4	.. .. ..	10. 6.00 „	51.30.26	132.56. 5. 5	
„ 4	.. .. ..	7.17.00 „	20.28.24	93.46. 6.	
„ „	.. .. ..	7.19.15 „	20.58.54	94.11.12.10	⊙ Altitude L. L. Bearing Centre.
„ „	.. .. ..	8.15.00 „	32. 9. 4	104.14. 3. 3	
„ „	.. .. ..	8.21.00 „	33.19.15	105. 3. 2. 3	
„ „	.. .. ..	8.26.00 „	34.18.14	105.56. 5. 5	
„ „	.. .. ..	8.32.10 „	35.33.28	107.27. 6. 5	
„ „	.. .. ..	8.37.10 „	36.30.25	108.26. 5. 4	
„ „	.. .. ..	7.45.00 P. M.	29.57.53	213.55. 5. 6	Sirius setting.
„ „	.. .. ..	7.50.00 „	29.20.15	214.52. 3. 4	
„ „	.. .. ..	7.54.30 „	21.32.35	76.31. 2. 1	Bootes rising.
„ „	.. .. ..	7.59.30 „	22.33.30	77.10.10. 9	
„ „	.. .. ..	8. 3.30 „	16.15.11	113.18. 9. 9	Spica rising.
„ „	.. .. ..	8. 8.40 „	17. 9. 4	114. 8. 8. 7	
„ „	.. .. ..	8.13.20 „	16.48.43	244.54. 3. 4	Rigel setting.
„ „	.. .. ..	8.21.30 „	15.17.12	246.12. 3. 3	
„ 5	.. .. ..	7. 5.10 A. M.	13.38.34	90.55. 4. 3	
„ „	.. .. ..	7.10.10 „	19.37.38	91.25. 5. 4	⊙ Altitude L. L. Bearing Centre.
„ „	.. .. ..	8. 9.40 „	31.37 34	104.23. 4. 2	
„ „	.. .. ..	8.14.40 „	32.28.23	104.55. 4. 3	

Observations for Azimuth,—(continued.)

Date.	Station.	Time.	Observed Altitude.	Bearing.	
1840.					
April 14	Olipore, ..	6.16.40 A. M.	12.42.39	84° 30′ 30″ 29″	⊙ Altitude L. L. Bearing Centre.
,, ,,	.. .. ..	6.20.00 ,,	13.25 24	85° 35′ 5′ 4′	
,, ,,	.. .. ..	6.23.35 ,,	14. 2. 5	85° 21′ 0′ 0′	
,, ,,	.. ..	6·27. 5 ,,	14 54.51	86° 10′ 0′ 9′	
,, ,,	.. .. ..	6.31.00 ,,	15.14.38	87° 24′ 5′ 3′	
,, 19	.. .. ..	9.45.30 P. M.	18.30.27	261° 53′ 4′ 3′	Procyon setting.
,, ,,	.. .. ..	9.51.45 ,,	17.18.14	263° 36′ 7′ 6′	
,, ,,	.. .. ..	9.57.20 ,,	16.13. 9	263° 49′ 9′ 50′	
,, ,,	.. .. ..	10. 1.45 ,,	21.10. 6	53° 43′ 2′ 3′	Lyra rising.
,, ,,	.. .. ..	10. 6.10 ,,	21.53.49	56° 1′ 2′ 0′	
,, ,,	.. .. ..	10.11.00 ,,	22.51.47	55° 11′ 10′ 11′	
,, ,,	.. .. ..	10.16.00 ,,	31.26.21	141° 39′ 9′ 9′	Jupiter rising.
,, ,,	.. .. ..	10.20.00 ,,	31.54.49	141° 28′ 9′ 8′	
,, ,,	.. .. ..	10.25.20 ,,	33 20.24	358° 40′ 2′ 1′	Polaris.
,, ,,	.. .. ..	10.30.30 ,,	33.25.20	357° 12′ 10′ 11′	
,, ,,	.. .. ..	10.46.30 ,,	19.38.34	242° 20′ 0′ 1′	α Hydræ setting.
,, ,,	.. .. ..	10.50.30 ,,	18.53.49	242° 57′ 8′ 8′	
,, ,,	.. .. ..	10.54.40 ,,	18. 7. 3	243° 40′ 1′ 1′	

Observations for Azimuth.

Date,	Station.	Time.	Observed Altitude.	Bearing.	
1840.					
April 21	Olipore, ..	6.41.00 P. M.	15.22.20	84° 0′ 1′ 1′	
,, ,,	.. .. ..	6.44.00 ,,			
,, ,,	.. .. ..	6.49 00 ,,	17.17.20	85° 51′ 1′ 0′	⊙ Altitude L. L.
,, ,,	.. .. ..	6.54 00 ,,	18. 5. 1	85° 40′ 0′ 39′	Bearing Centre.
,, ,,	.. .. ..	6.59.00 ,,	19. 5. 1	86° 20′ 0′ 19′	
,, 22	.. .. ..	6.28.15 ,,	12.55.51	79° 49′ 9′ 50′	
,, ,,	.. .. ..	6.33.15 ,,	13.57.54	80° 15′ 5′ 3′	⊙ Altitude L. L.
,, ,,	.. .. ..	6 38.20 ,,	15.	81° 41′ 0′ 0′	Bearing Centre.
,, ,,	.. .. ..	6.43.15 ,,	16. 5. 1	82° 23′ 2′ 2′	
,, ,,	.. .. ..	6.48.15 ,,	17. 7. 3	83° 17′ 6′ 6′	

These attempts at Azimuth observations were made with one of the small original Theodolites of Colonel Everest by Robinson, which I procured from Lieutenant Durant.

The Altitude arc had 2 verniers, the difference in the reading off generally amounting to 3′ 4′.

The Azimuth arc had 3 verniers, two of which generally gave the same result, the third differing 1′.

Both verniers read off to single minutes.

In the column of bearings the three minutes readings are not given in full, the first figure of the second and third readings not being given, except when it differs from the first figure of the first reading.

Thus 80° 15′ 5′ 3′ means, 80° 15′ 15′ 13′.

Thus 85° 40′ 0′ 39′ means, 85° 40′ 40′ 39′.

The time was taken by a watch of ordinary merit, attempted to be corrected to apparent time by observations made either about the time of observation for Azimuth or during the same day.

I give the observations in the hopes they may lead to some approximation to the truth; they were the first I ever made, and I was quite alone.

Observed Altitude.

1840.					A. M.		P. M.	
April	2	Pushut Fort,	..	⊙ L. L...	10. 0.15 =	100° 20′ 00″ =	1.46	}
					10. 1.20 =	100.40.00 =	1.45	} Equal Altitudes.
„	3	.. ..	..	.. ..	10. 2.20 =	106.00.00 =	1.44	}
„	3	.. ..	..	⊙ L. L...	9.44.40 =	96.20 =	1.59.10	}
					9.46.40 =	97.00 =	1.57	} Equal Altitudes.
„	14	Olipore,	..	⊙ L. L...	9.26.35 =	99.20 =	1.54.20	}
					9.27.35 =	99.40 =	1.54.30	} Equal Altitudes.
„	20	Olipore,	..	⊙ L. L...	9.47.15 =	96.00		
					9.48.35 =	96.30		
					9.50.00 =	97.00 Error 43″+		} Therm. 109. Bar. 27.25.
					9.51.15 =	97.30		
					9.52.36 =	98.00		
„	21	Olipore,	..	⊙ L. L...	8.56.40 =	85.40 =	2.58.25	
					8.57.30 =	86.00 =	2.57.40	
					8.58.20 =	86.20 =	2.56.45	} Equal Altitudes.
					8.59.15 =	86.40 =	2.55.50	
					9. 0.14 =	87.00 =	2.55.00	

I add these observations for time, which are very indifferent; my watch having no second hand, besides it is difficult, if not impossible, for a single observer to make accurate observations for time.

I also subjoin attempts at ascertaining the longitude of Olipore by Astronomical observations, which are open to all the objections I have mentioned.

Observed Altitude,—(Continued.)

1840.

April	23	Olipore,	7.27.20 A.M.	17° 6′ 2″	☽	Altitude U. L.
,,	,,	.. ..	7.29.00 ,,	25° 34′ 30″	☉	Altitude L. L.
,,	,,	.. ..	7.30.30 ,,	110° 54′ 10″		Lunar distance.
,,	,,	.. ..	7.32.00 ,,	26° 8′ 4″	☉	Altitude L. L.
,,	,,	.. ..	7.33.00 ,,	16° 26′ 22″	☽	Altitude U. L.
,,	,,	.. ..	7.34.00 ,,	110° 52′ 40″		Lunar distance.
,,	,,	.. ..	7.35.00 ,,	16° 10′ 6″	☽	Altitude U. L.
,,	,,	.. ..	7.36.30 ,,	27° 4′ 0″	☉	Altitude L. L.
,,	,,	.. ..	7.37.20 ,,	110° 51′ 20″		Lunar distance.
,,	,,	.. ..	7.38.00 ,,	27° 24′ 20″	☉	Altitude L. L.
,,	,,	.. ..	7.39.00 ,,	15° 39′ 35″	☽	Altitude U. L.
,,	,,	.. ..	7.40.00 ,,	110° 50′ 20″		Lunar distance.
,,	,,	.. ..	7.40.10 ,,	15° 25′	☽	Altitude U. L.
,,	,,	.. ..	7.41.00 ,,	28° 13′	☉	Altitude L. L.
,,	,,	.. ..	7.42.40 ,,	110° 49′ 40″		Lunar distance.

Observations for Time.

,,	,, ..	.. 7.51.50 =	60.30.00	Cloudy all the afternoon. Therm.
,,	,, ..	.. 7.53. 6 =	61.00.00	
,,	,, ..	.. 7.54.20 =	61.30.00	
,,	,, ..	.. 7.55.32 =	62.00.00	
,,	,, ..	.. 7.57.45 =	62.30.00	

For Longitude.

,,	24 ..	.. 7. 0.35 =	26° 48′ 44″	☽ Altitude Upper Limb.
,,	,, ..	.. 7. 1.35 =	26° 43′ 39″	
,,	,, ..	.. 7. 2.35 =	26° 28′ 33″	
,,	,, ..	.. 7. 3.35 =	26° 39′ 39″	
,,	,, ..	.. 7. 4.35 =	26° 29′ 25″	
,,	,, ..	.. 7. 6.35 =	20° 57′ 52″	☉ Altitude Lower Limb.
,,	,, ..	.. 7. 7.35 =	21° 9′ 4″	
,,	,, ..	.. 7. 8.35 =	21° 21′ 17″	
,,	,, ..	.. 7. 9.35 =	21° 32′ 29″	
,,	,, ..	.. 7.10.35 =	21° 45′ 41″	
,,	,, ..	.. 7.11.50 =	99° 53′ 40″	Lunar distances, Sextant.
,,	,, ..	.. 7.12.50 =	99° 53′ 30″	
,,	,, ..	.. 7.14.00 =	99° 53′ 15″	
,,	,, ..	.. 7.15.00 =	99° 53′ 5″	
,,	,, ..	.. 7.15.00 =	99° 52′ 40″	
,,	,, ..	.. 7.17.30 =	20° 29′ 25″	☽ Altitude Upper Limb.
,,	,, ..	.. 7.18.30 =	25° 24′ 20″	
,,	,, ..	.. 7.19.30 =	25° 19′ 14″	
,,	,, ..	.. 7.20.30 =	25° 14′ 10″	
,,	,, ..	.. 7.21.30 =	25° 9′ 4″	

For Longitude,—(Continued.)

1840.	h. m. s. A.M.		
April 24 Olipore,	7.23.00	„ = 24° 18′ 14″	
„ „	7.24.00	„ = 24° 28′ 24″	
„ „	7.25.00	„ = 24° 40′ 36″	⊙ Alt. Lower Limb.
„ „	7.26.00	„ = 24° 54′ 50″	
„ „	7.27.00	„ = 25° 6′ 2″	

Observations for the Time.

„ „	7.29.50 A.M.	= 51° 20′ 00″	
„ „	7.30.35	„ = 51° 40′ 00″	With Sextant.
„ „	7.31.29	„ = 52° 00′ 00″	Therm. 75. Bar. 27.25.
„ „	7.32.18	„ = 52° 20′ 00″	
„ „	7.33. 3	„ = 52° 40′ 00″	Error 43″+.
„ „	4.20.10 P.M.	= 58° 00′ 00″	
„ „	4.12.45	„ = 57° 40′ 00″	
„ „	4.13.31	„ = 57° 20′ 00″	With Sextant.
„ „	4.14.25	„ = 57° 00′ 00″	Therm. 80. Bar. 27.25.
„ „	4.15.16	„ = 56° 40′ 00″	

For Longitude.

	h. m. s. A.M.		
„ 25	6.43.20	„ = 66° 28′ 00″	
„ „	6.44.20	„ = 66° 27′ 00″	Altitude.
„ „	6.45.20	„ = 66° 24′ 50″	☽ UpperLimb Sextant.
„ „	6.46.20	„ = 66° 22′ 40″	
„ „	6.47.20	„ = 66° 21′ 00″	
„ „	6.49.00	„ = 17° 26′ 22″	
„ „	6.50.00	„ = 17° 39′ 34″	
„ „	6.51.00	„ = 17° 50′ 46″	⊙ Alt. Lower Limb.
„ „	6.52.00	„ = 18° 3′	Theodolite.
„ „	6.53.00	„ = 18° 18′ 14″	
„ „	6.55.00	„ = 88° 36′ 50″	
„ „	6.56.00	„ = 88° 36′ 25″	
„ „	6.57.00	„ = 88° 36′ 00″	Lun. distances, Sext.
„ „	6.58.00	„ = 88° 35′ 40″	
„ „	6.59.00	„ = 88° 35′ 25″	
„ „	7. 3.00	„ = 65° 31′ 00″	
„ „	7. 4.00	„ = 65° 26′ 00″	
„ „	7. 5.00	„ = 65° 23′ 00″	☽ Alt. Upper L. Sext.
„ „	7. 6.00	„ = 65° 19′ 00″	
„ „	7. 7.00	„ = 65° 14′ 50″	

For Longitude,—(Continued.)

1840.		h. m. s. A.M.			
April 25	Olipore,	7. 8.28	„	= 21° 23′ 19″	
„ „ ..	..	7. 9.30	„	= 21° 36′ 32″	
„ „ ..	..	7.10.30	„	= 21° 48′ 44″	⊙ Alt. Lower Limb,
„ „ ..	..	7.11.30	„	= 22° 2′	Theodolite.
„ „ ..	..	7.12.30	„	= 22° 15′ 11″	

Observations for Longitude entirely with Sextant.

			A. M.			
„	„ ..	..	7.16.00	„	= 64° 30′ 40″	
„	„ ..	..	7.17.00	„	= 64° 25′ 25″	
„	„ ..	..	7.18.00	„	= 64° 20′ 00″	☽ Alt. Upper Limb.
„	„ ..	..	7.19. 5	„	= 64° 13′ 40″	
„	„ ..	..	7.20. 0	„	= 64° 8′ 10″	
„	„ ..	..	7.23.20	„	= 48° 40′ 00″	
„	„ ..	..	7.24.10	„	= 49° 00′ 00″	
„	„ ..	..	7.25.00	„	= 49° 20′ 00″	⊙ Alt. Lower Limb.
„	„ ..	..	7.25.47	„	= 49° 40′ 00″	
„	„ ..	..	7.26.36	„	= 50° 00′ 00″	
„	„ ..	..	7.28. 5	„	= 88.27.00	
„	„ ..	..	7.29.00	„	= 88.26.25	
„	„ ..	..	7.30.00	„	= 88.25.50	Lunar Distances, Up-
„	„ ..	..	7.31.00	„	= 88.26.50	per Limb.
„	„ ..	..	7.32.00	„	= 88.25.35	
„	„ ..	..	7.33.00	„	= 88.25.30	
„	„ ..	..	7.34.00	„	= 88.25.10	
„	„ ..	..	7.36.30	„	= 62.16.00	
„	„ ..	..	7.37.30	„	= 62. 7.00	
„	„ ..	..	7.38.30	„	= 61.59.00	☽ Alt. Upper Limb.
„	„ ..	..	7.39.30	„	= 61.51.10	
„	„ ..	..	7.40.30	„	= 61.44.00	
„	„ ..	..	7.42.39	„	= 56.40.00	
„	„ ..	..	7.43.20	„	= 57.00.00	
„	„ ..	..	7.44.12	„	= 57.20.00	⊙ Alt. Lower Limb.
„	„ ..	..	7.44.55	„	= 57.40.00	
„	„ ..	..	7.45.40	„	= 58.00.00	
„	„ ..	..	9.31.54	„	= 100.00.00 = 2. 7.34	
„	„ ..	..	9.32.44	„	= 100.20.00 = 2.26.40	Equal Alt. for
„	„ ..	..	9.33.33	„	= 100.40.00 = 2.25.45	the time.
„	„ ..	..	9.34.25	„	= 101.00.00 = 2.24.55	

Observations for Longitude with Sextant.

1840.		h. m. s. A. M.			
April 26	Olipore,	7.21.00	„	= 76° 8′ 20′	☽ Alt. Upper Limb.
„ „ ..	..	7.22.00	„	= 76° 8′ 20′	
„ „ ..	.	7.23.00	„	= 76° 7′ 50′	
„ „ ..	..	7.24.00	„	= 76° 6′ 10′	
„ „ ..	..	7.25.00	„	= 76° 5′ 30′	
„ „ ..	..	7.27.50	„	= 51° 40′ 00′	⊙ Alt. Lower Limb.
„ „ ..	..	7.28.38	„	= 51° 00′ 00′	
„ „ ..	..	7.29.22	„	= 51° 20′ 00′	
„ „ ..	..	7.30. 8	„	= 51° 40′ 00′	
„ „ ..	..	7.30.58	„	= 52° 00′ 00′	
„ „ ..	..	7.33.00	„	= 76° 43′ 20′	Lunar distances, Upper Limb.
„ „ ..	..	7.34.00	„	= 76° 42′ 40′	
„ „ ..	..	7.35.00	„	= 76° 42′ 50′	
„ „ ..	..	7.36.00	„	= 76° 42′ 20′	
„ „ ..	..	7.37.00	„	= 76° 42′ 20′	
„ „ ..	..	7.38.00	„	= 76° 41′ 20′	
„ „ ..	..	7.39.00	„	= 76° 41′ 25′	
„ „ ..	..	7.42.00	„	= 75° 27′ 40′	☽ Alt. Upper Limb.
„ „ ..	..	7.43.00	„	= 75° 24′ 25′	
„ „ ..	..	7.44.00	„	= 75° 20′ 45′	
„ „ ..	..	7.45.00	„	= 75° 16′ 30′	
„ „ ..	..	7.46.00	„	= 75° 12′ 20′	
„ „ ..	..	7.48.39	„	= 59° 20′ 00′	⊙ Alt. Lower Limb.
„ „ ..	..	7.49.21	„	= 59° 40′ 00′	
„ „ ..	..	7.50. 9	„	= 60° 00′ 00′	
„ „ ..	..	7.51.00	„	= 60° 20′ 00′	
„ „ ..	..	7.51.48	„	= 60° 40′ 00′	

Observations for Time, Equal Altitudes.

		h. m. s. A. M.			h. m. s. P. M.
„ „ ..	..	9. 8.29	„	= 91° 20′ 00′	= 2.51.20 „
„ „ ..	..	9. 9.25	„	= 91° 40′ 00′	= 2.50.32 „
„ „ ..	..	9.10.17	„	= 92° 00′ 00′	= 2.49.44 „
„ „ ..	..	9.11. 9	„	= 92° 20′ 00′	= 2.48.51 „
„ „ ..	..	9.12. 2	„	= 92° 40′ 00′	= 2.47.48 „

In submitting these observations, I beg that it may be understood that I do not claim for any, except those for Latitude, even a tolerable amount of correctness. They are only the attempts of a tyro, under considerable disadvantages; and I dare say are rendered worthless by omissions, and even by absurdities. I have no theoretical knowledge of the subject whatever. Symes Nautical Tables have been my guide, and I have endeavoured to follow him, to the best of my ability.

I should not have ventured to submit those for Azimuth, Time or Longitude, did I not believe that no more competent person than myself has been at Olipore.

Grammar and Vocabulary of the Cashmiri Language. By M. P. Edgeworth, Esq. *Bengal Civil Service.*

When stationed at Lodihana in 1839, I was induced to attempt to learn the Cashmiri language, in consequence of the large Cashmiri population at that place, many of whom understand no other language, and the necessity of an interpreter in a Police office, I felt to be exceedingly objectionable. With the assistance of Meer Saifuddin, a respectable Syud of Cashmiri birth, I drew up some rudiments of the Grammar. Although these are necessarily very imperfect, and no doubt require numerous corrections, which I should have been able to give, had I been able to prosecute the study further, yet they will be interesting, as throwing some light on what appears to me a very intricate and peculiar dialect.

Alphabet and Orthography.

The Cashmiri language being a derivation of the great Sanscrit stock it has an alphabet of the Nagari form. This is only understood by the Hindoos. The translation of the New Testament published at Serampoor is in this character, and I was able to ascertain the force of most of the signs used in it; but as they do not complete the Alphabet, and I had no means of ascertaining their correctness from any Hindoo Cashmiri, I refrain from giving it.

The cerebralt. and the aspirates of the Nagari are all used, and an additional letter *a* and its aspirate *ts*. and ts,h, exactly the German z with or without an aspirate; this is represented in the Persian alphabet by ز— As numerous Arabic and Persian words have been introduced, the whole of that alphabet has been incorporated with that portion, equivalent to the Nagari, as in Hindostani.

The great peculiarity of the language consists in possessing three very short vowels, which my instructor denominated the ním fathe, ním kasra and ním zamma, and possessing respectively the forces of a very short a, i, u. It is impossible to give a description in writing of these very peculiar half-vowels. To represent them, I have used the above vowels with a dot, ȧ, ï, u̇.

There is likewise a short o, "*zamma majhúl,*" and its corresponding half-vowel.

General Remarks.

The language resembles Hindostani in the two most troublesome parts of that language, but with increased difficulties. The genitive case agrees with the object possessed in gender, number and case having moreover different forms according as the possessing noun is itself masculine, feminine, or neuter.

In like manner the past tenses of the verb agree with the object, while the agent has a peculiar form, which I have termed the agentive case; but the verb agrees in some measure with the agent, as well as the object; at least assumes a modified form according to the person and number of the agent. The verb is in like manner subject to modifications of its termination, where the enclitic pronominal dative is used.

The verb is generally placed in the middle of the sentence as in English; but the object is indifferently placed before or after it.

In forming feminines, the letter of the masculine is generally changed thus:—

m.

d—g—zorj.

t———ts.

k———ch.

n———nj. (the nasal *n̲a* of the Nagri,) ñ of the Spanish.

l———j.

Nouns.

The genitive is formed by adding as the case may be.

	m. s.	*an.*	*m. p.*	*f. s.*		*f. p.*		
S. Masculine	Sand	(an)	sandi	sanz	(ac)	sanza	sindes*	In all but proper names.
Feminine, or	hand	(a)	handi	hanz	(za)	hauza		Plural in all genders and
Neuter	uk	(ik)		ich	(icha)			and cases.

The accusative by the addition of *as* or *is* in the singular, and *au̲* in the plural, thus:

Singular.

Nom.	Máül, *a father*	Nichu, *child*	
Gen.	Málü, sand, &c.	Nichu, sand	In proper names the genitive is formed by simply adding *un*, as
Ac.	Mális	Nichavis	
Agent.	Maïl	Nichavi	

Plural.

Nom.	Máïl	Nichavi	Nom.	Nushírwán,
Gen.	Máïlan, hand	Nichavin, hand,	Gen.	Nushirwánun
Ac.	Máilan	Nichavin		
Ag.	Mailaw	Nichvau,*		

Singular.

Nom.	Gabur, (*son*)	
Gen.	Gabra sand	
Ac.	Gabras,	
Ag.	Gabran,	

Plural.

Nom.	Gabar,	
Gen.	Gabran, hand	
Ac.	Gabran,	
Ag.	Gabrau,	

Feminine.

Singular.	Nom.	Máj, mother,	tsut, bread	
	Gen.	Máji, Majihand,	tswachi,—hand	
	Ac.	Máji,	tswachi,	
	Ag.			
Plural.	Nom.	Máji,	tswachi,	
	Gen.	Májan, hand,	tswachan, hand	
	Ac.	Májan,	tswachan,	Agentive also with
	Ag.	Májaw,	tswachaw,	*filled*—ablative.
	Ab.			

Neuter.

Nom.	Nág, had, fountain	garu, house
Gen.	Náguk, ich, ik, icha,	garuk, ich, iki icha.
Ac.	Nágas	garas
1st Abl.	Nága, nishi, &c.	
2d Ab.	Nági, khota, &c.	
Nom.	Nag,	gar
Gen.	Nágan hand, &c.	garan hand, &e.
Ac.	Nágan,	garan

* This word in the Serampur Testament is spelt nits,hu.

Personal Pronouns.

	1.		2.		3.	
Nom.	I, Bo	We, Asi	Thou, tüü	You, Túi	He, sú	They, Tim
Gen.	of me, Mi*	us sa*	Chá*	Tuh**	Tih***	Tih
Acc.	to me, Mih	us asih	Tsih	Tohih	tas or	timan timar
Inflected.	me, Mi	us asi	tsi	Tohi	timis	timay

* Genitival terminations.

	m.	*f. s.*	*f. p.*
	ànyu,	àryi,	àiyniy, ànyèy, ànis.

** hand, hanz, handi, hanza handas. ïs

*** Also ta and tine with *súnd, &c.* sanz, sandì, sanza.

Demonstrative and Relative Pronouns.

	This *m* or *f.*	*Neuter.*	These m. f. n.
Nom.	Ih	yamikü.* or ami.**	yim or yima.
Gen.	ya or yim, or am or a.—sand &c.**		yiman haud &c.
Acc.	Yamis or amis**	yat or at**	yiman
Inflected.	Yaimis. *m.* Yim *f.* Yami	yata or ami**	yiman yimon

* The genitival terminations of the neuter are iku, íchs, ikí, ìchi.

** This form is used in a particular or proximative sense.

	That—near.	*Neuter.*	*Those Plural.*	That distant.
Nom.	Hú	humiku.*	hum, hume	See as above, without distinction of gender.
Gen.	Humi s & c.	hut	human haud.	
Acc.	Humis	huma	human.	
Abl.	ditto		humou.	
	Hwim			

	Who relate.	*What.*	*Who: Plural.*	*Who? inter.*	*Neuter.*	*Plural.*
Nom.	*m.* yus e.		yim or yima.	*m.* kus.		kam, kanie.
	f. yasa.			*f.* kasa.		
Gen.	ya or yami.	yanieka.*		ka or kami-s &c.	kamikü.	
Acc.	yas or yamis.	yat.	yiman, &c.	ka hand, &c.	kat.	kamau.
Abl.	ditto.	yama.		kas or kamas.	kami.	
	yim.			kim.		

Adverbs of time and place derived from the above.

		Of Place.			*Of Time.*	*Of Manner.*	
		at.	to.	by.			
	this.	Here *át*.	here to.	hither *way*.			is
This—and what relation.	ih.	yati.	yátü.	yor.	wiryakan.		hä pat or kau.
That—near.	hu.	hati.	hátü.	or.			huta pat or kau.
That—distant.	sú.	tàti.	tátü.	tor.	(then) tilli.	(so)	tata pat kau.
Interrogation. what?—	kus.	kàti.	kátü.	kor.	(when) kella, or kar.	(how)	kyut, khya, khyetapatï, kau.
Relation. what—	yus.	yati.	yatu.	yor.	yella.	(as)	yut, itu, itapatï, kau.

Why? kyázi.
How many? kyt, kytu, kytï, *f.* kyts, *f.* kytsa.
Yet, winya.
Ever, mullye, aslá.
Till, yut táü.
Always, hamesha, dad.

Adverbs.

much, seta yits, tsor, tseri, tsar
little, maine—kam
without, nibar
within, andar
above, hyùr
from above upwards, herì pita
downwards bon
below, tal
before, boût
after, pat, patï
directly, tìkan, wil
yesterday, yow
day before yesterday, átra
to-day, az
to-morrow, pagah or rúts
day after to-morrow, kálkyat
together, sait

Conjunctions.

p. *h.*

Even ای ہٕ i
and, ta, or be
or ya, kina ?
though,
although, yudunte, agarche
since, yelli
because, yowkani
if, yudwai, hargahai, hargah, or *ai* added to the nominative
but, lekin, ama
unless, nai

m. *f.* *m.p.* *f.p.*
except, magar, yátü, yáts, yáti, yatsa

then پس adi
therefore, awaí or awaì khatìr
else, nata
either,

Prepositions.

from, nishi-pita ; a after a poss.
by, nishi
to, not
upon, pèt
after, pat
before, borit borita
with, seit, swán
without, ru'st
near, nish
in, andar

m. s. *f. s.* *m. p.* *f. p.*
for, kyut, kylits, kyit, kyits
on account of, khatír, after genitive
between, manz, manzbag
towards, kun
than, (comparison) khota
except, (but) yatu, siwa, warai, rust

m. *f.*
equal to, yatu, or *sambü, sambï asamb*
just now, àdi
also, ti
like, although ! zan

sait, meaning *with* governs the accusative
sait, meaning *by means of*, governs the genitive or the case in *au* in plural.
andra, between, governs "*i*" in singular, "*au*" in plural.
khota, without, governs genitive, or accusative in plural, and in the neuter, the ablative in "*i*."

Pronouns and Pronominal Adjectives.

Some.	*m.*	kats	kaitï	kaityah	katsan
(several)	*f.*	katsa	katsa	kaitsah	kaithyan

Any.	*m.*	kunh	kaúh	koutshah	kainsi
	f.		kaúh	kautshah	

Some.	*nom.*	kiuh,	keutshah,	k	
(few)	*obj.*		keutsau.		

Such.	*m.*	titú,	*accus.*	tithis	*pl.*	titi	tithan
(taisa)	*f.*	titsa		titsi		titsaha	titsan

Kaisa.	kitü or kihü	kithis, kihis	kiti, kihi	kithan, kihan
	kitsa or kish	kitsi, kishi	kitsaha kishi	kitsan, kishan
Jaisa.	yutü	yithis	yìti	yithan
	yitsa	yitsi	yìtsahä	yitsahan
Aisa.	hutü	huthis	huti	huthan
	hutsa	hutsi	hutsaha	hutsahan

The termination *m.* hut, hatï, *f.* hats, hatsa, is equivalent to the Persian *nák*, or English "full."

Verbs.

The substantive and auxiliary verb "to be," "to be to," *i. e.* to (have, with dative and indicative.)

1. *Present Indefinite.*

1	♂	chhus, *am*	chhi	chhum	chhu
	♀	chhes	chhe	chhem	chhe
2	♂	chhukh	chhiwa	chhwi	chhowa
	♀	chhekh	chhewa	chhi	chhewa
3	♂	chhú	chhi	chhus	chhukh
	♀	chhé	chhí	chhis	chhekh

2. *Past Indefinite.*

1	♂	ásus, *was*	aïs	ásum	ásü
	♀	Ases	áäsä	ásem	asï
2	♂	asukh	áséwa	áswi	ásuwa
	♀	ásekh	ásewa	ásí	ásewa
3	♂	áüs	áïs	ásus	ásukh
	♀	áäs	áäsan	áses	ásekh

3. *Aorist, or Future,* May or will be.

1	áäsa	áäsaw
2	áüsakh	áäsyú
3	áäsï	áäsan

4. *Present Definite,* am

ásán chhus, &c. ásanchhum, &c.

5. *Perfect,* have been

ásán ásus, &c. ásán àsum, &c.

6. *Imperfect,* was being

a'smut chhus, &c. a'smut chhum

7. *Pluperfect*, had been.

a′smut a′sus a′smut a′sum

8. *Conditional Past*, might have been.

ásmut áasa, &c.

V. A. Intransitive, bihun, to sit; wathun, to stand up; pyun, to fall.

Imperative.

s.	2.	bih, sit	wath	pi
	3.	bihin, let him sit	wathin	piyin
pl.	2.	bihyü	wathyú	piyú
	3.	bihin	wathin′	piyin

Aorist, or Future.

s.	1.	biha	watha	pima
	2.	bihakh	wathakh	pikh
	3.	bihi	wathi	piya
pl.	1.	bihow	wathow	pimow
	2.	bihyú	wathyu′	piyu
	3.	bihan	wathau	piyan′

Present.

withan, chus piyán′ chhus
——— chhukh
——— chhu, &c. &c.

Imperfect.

Bihan ásus
—— ásukh
—— áus, &c.
—— asa
—— asakh
—— asi, &c.

Masculine.	Byuthus	wuthus	pyos
	byuthukh	wuthukh	pyokh
	bihuth byúth	woth	pyou
	bethï	wuthï	
	bethwa	wuthiwa	
	bethi	wuthi	
Feminine.	bethis	wutsus	
	bethikh	wutsekh	
	beth	wuts	
	becha	wutsa	
	bechawa	wutsewa	
	becha	wutsa	

	Perfect.	*Pluperfect.*
m. s. 1.	byuthmat chhus	asus wuthmit
f. s. 1.	bethmits chhes	watsmuts
m. p. 1.	bethmit chhi	withimit
f. p. 1.	bechamatsa chhe	watsimatsa
	behawun	bihunwal

Active Transitive Verb—karun, To do.

I *Mood.—Tenses, with Objective Inflections like the Future.*

I.—*Imperative*—do.

		1	2	3	4	5	6	7
Masculine and Feminine. plur. sing.	2	kar,	karan	karakh	———	———	———	———
	3	—— karin	karinas	—— ùrakh	aninye	aninawa	———	———
	2	karyú	kar yun	—— yukh	———	aninawe	———	———
	3	—— in	— inas		aninai		———	———

II.—*Aorist or Future.* Will or may do.

Feminine. plur. sing.	1	kar-a	kar-au	kar-akh	kar-at	kar-awa
	2	— akh	— ah-au	— ahakh	— —	———
	3	— i	— is	— ikh	t'	— iwa
	1	— ow	— owu	— owkh	— owt	— owa
	2	— yu	— yun	— yukh	—	———
	3	— au	— auas	— auakh	— aui	auawa

III.—*Present.* Am doing.

Feminine. Masculine.	karán	chhus	chhus-an	chhusakh	chhusat	chhusawa	
	——	chhukh	chhuk-au	chhuhakh	———	———	
	——	chhu	chhus	chhukh	chhwi	chhúwa	chhum chu-asi.
	——	chhi	chhin	chhikh	chhit	chhewa	
	——	chhawa	chhawan	chhawakh	———	———	
	——	chhi	chhis	chhikh	chhwi	chh'iwa	
	——	chhes	chhesan	chhesakh			
	——	chhekh	chhehan	chhehakh			
	——	chhe	chhes	chhekh			
	——	chhe	chhen	chhekh			
	——	chhewa	chhewan	chhewakh			
	——	chhe,	chhes	chhekh			

The same as 1. with *asi* added

IV.—*Imperfect.* Was doing.

karan′ ásus ásus-au ásus-akh ásus-at ásus-awa &c. &c.

V.—*Imperfect.* Might be doing.

karan′ asa kuan′-asau &c. &c.

VI.—*Respectful Imperative.* Please to do.

2 karta kartan
3 karïtan karitanas

2 kartyú kartyun
3 karitan karitanas

Infinitive.

m. s. karun *m. p.* karanï *f. s.* karany *f. p.* karaniya

Present Participle.

m. s. koronwáül, declined like maül
or korowunnü
f. korouwaj
korowvajyaў
pl. kor-onwajiniye
—— iwiainya

Perfect Participle.

korit, indeclinable.

II.—*Tenses with Objective Inflections, like the Past Indefinite.*

			Objective. 3d Person.		2d Person.		1st Person.		*Dative.* 2d Person.
			singular.	*plural.*	*singular.*	*plural.*	*singular.*	*plural.*	*singular.*
Object. Mas.	*Agent. plural. singular.*	1 karum	um	im-tim	umakh	imúa	——	——	umai
		2 —— ut	uthan	it	——	——	uthas	it-asi	——
		3 —— u	un	in	unakh	inawa	unas	un-asi	unai
		1 —— u	ú	ü	ukh	inawa	——	——	unai
		2 —— uwa	uwan	ūva —	——		uwas	iwa-asi	——
		3 —— ukh	ukh	ikh —	uhakh	ihawa	uhas	èkh-asi	uhai
Object. Fem.	*Agent. plural. singular.*	1 —— em	em	em	emakh	imua	——	——	
		2 —— et	ethan	etham —	——	——	ethas	et-asi	
		3 —— i	in	in ——	inakh	inawa	inas	in-asi	
		1 —— i	ai	ai	ikh	inawa	——	——	
		2 —— ewa	iwan	iwan —	——	——	iwan	ewa-asi	
		3 —— ekh	ikh	ikh ——	ihakh	ihawa	ihas	ikh-asi	

			Pluperfect 1st form.	*Perfect*	*Pluperfect 2d form*
Obj. Masculine.	*Agt. pl. Agt. s.*	1 komy am	karmut chhum	karmut ásum
		2 —— yát	—— chhwi	—— áswi
		3 —— yán or yún	—— chhus	—— áus
		1 —— yáu	karïmitï chhu	karïmitï áüs
		2 —— yúwa	—— chhowa	—— ásowa
		3 —— yákh or yúkh	—— chhukh	—— ásukh

Obj. Feminine.	Agt. Pl. Agt. S.		*Pluperfect* 1st *form.*	*Perfect.*	*Pluperfect* 2d *form.*
	1	kom	yaiyam	karimits chhem	karimits ásem
	2	——	yaitha	——— chhiyai	——— ási,
	3	——	yaiyan	——— chhes	——— áses
	1	——	yaiya	— mitsï chhe	karimitsï ásu
	2	——	yaiyewa	——— chhewa	——— ásewa
	3	——	yaiyekh	——— chhekh	——— ásekh

Past Conditional.
Karmut asi, &c. &c.

The changes in termination for the enclitic object follow this rule—s. of 3d person before akh, as, asi, becomes *n*
kh ..... h

In the 2d singular *th* is inserted after the open vowel.
The i of masculine becomes e in feminine.
a or u of singular becomes i in plural.

	Accusative.				*Dative.*	
The enclitic pronouns used with verbs are :	(*him*)	su	(*them*)	tim	*s.*	*p.*
	thu	tsi	ye	tuih	tás	timan
	me	*bu	us	asi	aitzi	tuih
	(*often omitted.)				mih	asi.

General Observations on the Verbs.

The negative is formed by adding *na* in all tenses except the *common* imperative; and in compound tenses it is added to the auxiliary, not the participle, for the auxiliary and participle may be separated and dislocated at pleasure, *chhus na korán* or *korán chhus na*. The interrogative is formed by adding a *fatha* to a silent consonant or a dissimilar vowel. If the vowel be *fatha* it is lengthened into *ā*, the expletive *ma* is sometimes used, if negative interrogative *ná* is used instead of *na*.

In the imperative *m* or *ma* is prefixed instead of *n* affixed, except in the imperative in *zí*, when *na* is used as usual.

Intransitive verbs agree with their nominative in number, person, and gender.

Transitive verbs agree with their object and nominative in gender, number and person, with their agent in number and person, but not in gender in the past tenses, *i. e.* of the second mode as,

A man called a woman	A man called a man
Mahnivi manjin zanána	Mahnavi mangan mahnyu
A woman called a woman	A woman called a man
Zanáni manjin zanána	Zanáni mangan mahnyu

The passive is formed by declining *Yun*, to come, with the passive participle in "*mut*."

The causal verb is formed by adding "*náwun*" to the root, as *sherun*, to adorn; *shernáwun*, "cause to adorn."

Form of Verbs of Quality. As *Pranun*, to be white.

		Imperfect.	*Aorist.*	*Past. Masculine.*	*Feminine.*	*Participle,* (siffat.)
sing.	1.		prana	pran yús	yiyas	*m. s.* pranyo′ mutü, *pl.* mitï
	2.	Pran	—— akh	—— yukh	yiyakh	*f. s.* ——— mitsi, *pl.* matsa
	3.	Pranin	—— i	—— yó	yiya	or pranyimitsi
plural.	1.		—— au	—— yai	yiya	*Second Participle or Adjective.*
	2.	Pranyu	—— yu	—— yawa	yiyiwa	*m. s.* praṇu prani
	3.	Pranin	—— an	—— yai	yiya	*f. s.* prany pranya

Substantive derived thence, pranyer whiteness.
Transitive Verb ditto, panyaráwan to whiten.

Similar to this are the following :—

Infinitive.	*Participle.*	*Mas.* s.	*Mas.* p.	*Fem.* s.	*Fem.* p.	*Substantive.*	*Transitive Verb.*	*English.*
anun	anyomut	anu	- i	anyi-iya		anyar	anyarawun	be blind
ats,hun	ats,hyomut	ats,hu	- i	ats,h-iye		ats,har	ats,harawun	be lazy, *sust*
badun	badyomut	badu	- i	bad-baji		bajar	badráwun	be large
budun	budyomut	budu	- i	bud-buji		bujar	budráwun	be old
chhunun	chhunyomut	chhunu	- i	ny-nyiya		chhunyar	chhunyárun	be less
chhetun	chhetyomut	chhetu	- i	chhets-a		chhetsir	chhetsarawun	be white
darun	daryomut	darü	- i	dar dare		darir	dararáwun	stammer
dúrun	dúryomut	dúru	- i	dúr dúra		dúrir	dúraráwun	be far

Infinitive.	*Participle.*	*Mas.* *s.*	*p.*	*Fem.* *s.*	*p.*	*Substantive.*	*Transitive verb.*	*English.*
———	———	gatu	- i	gat	gacha	gachar	gachrawun	straight
halun	halyomut	halu	- i	haj-haja		hajar	halrawun	crooked
———	———	hihu or hyù	- i	hish-i		hishar		like
kalun	kalyomut	kala	- i	kaj-a		kajar	kajrawun	dumb
kánun	kányomut	kánu	- i	kány-ya		kanyar	kanyarawun	one-eyed
kochnun	krehnyomut	krehnu	- i	ny - ya		khhnyar	krehnyarawun	black
lidrun	lidryomut	lidru	- i	- - - rih		lidrir	lidrawun	yellow
lókun	lókyomut	luku	- i	luh - i		lóchar	lukrawun	small
matun	matyomut	matu	- i	mats - a		matsar	matsarawun	mad
míthun	mithyomut	myuth, metts	i	mitts, michhi		michhar	mithrawun	sweet
nanun	nanyomut	nanu	- i	ny, nyige		nanyar	nanyarawun	evident
nílun	nilyomut	nyul, neli	- i	nej, neja		nejar	nijrawun	blue
nunun	nunyomut	munu	- i	ry ryia		nunyar	nunyarawun	salt
sanun	sanyomut	sanu	- i	ry ryiya		sanyar	sanyarawun	attentive
sidun	sidyomut	sidu	- i	siz - a		sizar	sizrawun	straight
tithun	thidyomut	thadu	- i	theg - a		thazar	thazrawun	tall
thiun	tithyomut	tïthu	- i	titts, ticka		tichar	tithrawun	bitter
tsukun	tsukyomut	tsuku	- i	tsuk - a		tsukar		acid
ts,hethun	tshetyomut	tsotu	- i	tshot, tshochi		tshochar	tshotrawun	short
wozlun	wozalyomut	wozalu	- i	wozaj, wuzaj-a		wozjar	wozlawun	red
zethun	zethyomut	zyutts, zeth	i	zcth, zechhi		zechhar	zithrawun	long
nyakan	nykyomat	nyuk	niki	nichh	nichha	nichhar	nikrawan	be little or thin
vyethun	vyethyomut	vyuth	vycthi	vyith	vyichhi	vyechhar	vycthrawan	

		Irregular Intransitive Verbs.						*Defective Verbs.*	
		Go.	Come.	Die.	Go out.	Be sick.	Remain.	Be able.	Behove.
					Imperative.				
1	*s.*	gats,h	ih	mar	nér	los	roz		
2	*p.*	gats,hyu	iyu	maryu	nêryu				
					Aorist.				
1		gatsha	yirma	marà	néra	losa, &c.	roza, &c.	tagyas	pazyas.
2		—— akh	yikh	—— akh				tagyi	pazyi.
3		—— i	yiya	—— i				tagyan	pazyem.
1		—— ow	yimau	—— ow				tagyakh	pazyakh.
2		—— yu	iyu	—— yu				tagyiwa	pazùsa.
3		—— au	yiu	—— au				tagi	pazi.
					Present, &c.				
		gatshan	yiwan	maran	neran.				
					Past Indefinite.				
Masculine.	1	gós	ás	mudus	draüs	lustus	rudus	tagus or tog	
	2	gokh	ákh	mudukh	draükh	lustukh	rudukh	togwi	
	3	gau	ás	mud	dras	lust	rud	togum	
	1	gai	ái	múdi	draï	luist	rudi	togukh	
	2	gawa	áwa	mudiwa	drawa	lustiwa	rudiwa	togiwa	
	3	gai	ái	mydi	draï	lusti	rudi	togwe	

Past Indefinite.

Feminine.	1	gayes	áyes	moyem	lutshes	ruzas	tajis
	2	gayekh	áyekh	moyekh	lutshikh	ruzekh	&c.
	3	gaye	áye	moye	lutsh	ruz	
	1	gaye	áye	moye	lotsha	ruza	
	2	gayewa	áyewa	moyewa	lotshawa	ruzawa	
	3	gaye	áye	moye	lotsha	ruza	

Pluperfect.

m.	1	gayáu	ayati	moyas	lotshau		
f.	1	gayái	ayayi	moyaye	lotshaye		

Participle-perfect, Pluperfect, &c.

m.	*s.*	gomut	ámutü	mudmut	lotsmut	rudmut	togmut
m.	*p.*	gomiti	ámitï	mudmiti	or lostnut		togmiti
f.	*s.*	gomuts	ámits	mumits	lotshmuts	ruzmut	tijmits
f.	*p.*	gomutsa	ámitsa	mumitsa	lotshamutra		tijmitsa

Infinitive.

	gats,han	yun	marun	turun	losun	rozun	tagun

Infinitive.
Déhsan, To see.
Imperfect.
Caut,

Aorist.
Desha.
Participle.
Deshan.

Past.

Masculine.	*Feminine.*
Dyútham.	Déthim.
——— ut.	Déthit.
Dyúth.	Détts.

Participle.

Dyúthmut.	Déthmits.
Dyúthmiti.	Déthmitsi.

Anun, *v. a.* to bring.
Anun, *v. n.* be blind.
Atsun, *v. int.* go in.
tsáu
tsái
Alun, *v. n.* to nod head.
Alráwan, *v. a.* to make nod.
Asun, *v. n.* to laugh.

A.

Apuz, *s. m.* a lie.
Apuzyar, *adj.* false.
Ashü, *s. m.* tear.
Achhü, *s. f.* eye
Achur, *f. m.* word.
Agur, uncut (wood.)
Anü (*pronounced ön*) blind.
Ainy, *fem.*
Anachiwa, gagür, } musk rat.
Agun, *s. f.* fire, (especially for cooking, while Nár is any fire.)
Athá, loose, also hands.
Ant, Anchi, *pl.* } stone (of fruit.)
Adij, Adja, } *s. f.* bone.
Adyul, large bone.
Alü, plough.

AI.

Ail, *s. f.* cardamum.
Athij, *s. f.* paste.
Aïr, hunting.

B.

Behun, بٕوردن to sit,
Bazun, to hear or understand.
Bázu, regular.
Bagrun, *v. a.* to share.
áwan, *v. a.* to divide.
Bawun, *v. a.* to explain.
Buzun, to fry.

Batu, cooked rice.
Baya, female.
Buth, *s. m.* face.
Báts, *s. m. p.* people.
Bachhera, fool.
Bungir, *s. f.* "churi," bracelet.
Bunj, *s. f.* plane tree.
Bai, brother.
ikakin, brother's wife.
putr, brother's son.
waza, brother's daughter.
Bagü, *s. m.* share.
Benji, *s. f.* sister.
Braür or byaur, Bráir, } cat.

CH.

Chyun, to drink.
Chapan, to hide (in a place,) or tsipun (from a person.)

Chapat, *pl. ts. s. f.* slap.

CHH.

Chhewun, be drunk.
Chhevyar, (as pranun.)
Chhihun, *v. a.* to tease.

D.

Dawun, Dorun, } to run.
Deshun, to see.
Dyutar, *p.*
Detin, imperative caret.
Dyutmut.
Detmits.
Dawun, *v. a.* to cause, to give.
Dazan, *v. n.* to burn, or be burnt.
Dyun, to give, shut, tie.

Dädu, *s. m.* pain.
Dányu, rice, growing.
Duni, whip.
Diuth, Dreuth, } sight.
Dolá, oblique.
Dwod, *s. m.* milk.
Dand, *s. m.* bull.
Dallun, *v. n.* pass, to pass by, to pass from.
Dollmut, to blow.
Dalán, *v. a.* transitive of the above.
Dálmut.
Dajmits.

G.

Gonzurun, *v. r.* to think, count.
Grezun, to roar, (tiger, river.)
Garun, to cut, (as a carpenter,) make (as an ironsmith.)
Gewun, *v. n.* to sing.
Gyo, *m. and f.* the same.

Gotsur, *s. f.* small purse.
Garu *s. m.* house.
Gurü, *s. m.* horse.
Gad, *s. f.* fish.
Gádáháuz, fisherman.
Gub, *s. f.* sheep.
adj. also pregnant.
Gagür, *s. m.* / ir, *s. f.* } rat.
Gwadü, *s. m.* by, below the knee, stem of a tree.
Gáthu, wisdom.
ul, *m.* / ij, *f.* } *adj.* wise.

H.

Harahar, dispute.
Hít, pretence.
Háts, *s. f.* false accusation.
Hún, *s. m.* / Húiry, *s. f.* } dog.
infl. Háïn.
Hórun, *v. a.* to repay.
Halun, (in sco)
Halyómut.

Hárun, to lose in play.
Hyun, to take.
Hyikun, to be able.
Háwun, *v. a.* to show.
Hana, *v. f.* a little not used with grains or as a diminutive Gor hana, a small horse.
Hí, jasmine.
Hí-asmán, lilac.
Harana, antelope
Hángaul, deer.
Háuz, boatman; not inflected, in the agentive case.
Hichhun, *v. a.* learn.
Hichhnáwan, *v. a.* teach.
Haud, *s. m.* ram.
Hash, *s. f.* mother-in-law.
Hár, *s. f.* cowrie.
—— *s, m.* necklace.
Höl, hil, *m.* / Haj, haji, *f.* } crooked.

H.

Hol, *s. m.* waist.
Hárinj, *s. f.* bow.
Hól, *s. f.* flabergastation.

K.

Karun, to do.
Kreshun, to desire.
Krushmut.
Krushmits.
Krehnun, to be black.
Khasun, to mount.
Kunun, to sell.
Kobun, (in sco) be hump-backed.
Katurun, to cut in two.
Kadun, to draw.

Kath, *s. f.* word.
Káum, kami, *s. f.* business.
Krek, cry, lament.
Kallá, *m.* head.
Kath, *s. m.* beam, gallows.
Kautúr, cock sparrow.
Kastúr, *s. m.* nightingale.
s. f. musk.
Kéns, younger in age.
Kulü, *s. m.* tree.
Kuj, *s. f.* plant.
Kol, *s. f.* small river.
Kub, *s. m.* hump-backed.
Kobyar.
Kuthü, *s. m.* room.
Kath, *s. m.* sheep, ram.
Kaú, *s. m.* arrow.
Kor or khwar, foot.
Kutú, *s.* knee.
Kokúr, *s. m.* / —— ir, *s. f.* } cock and hen.
Kaúr, *s. m.* neck.

KH.

Khyun, to eat.
Khasún, khout, khâits, } to mount, (used with took to form)
Khotsun, *v. s.* or *v. t.* fear.
Kharun, *v. a.* causal of Khasun,
Khanum, to engrave to dig.

Khanda wao — shálbáf.
Kachul, *s. m.* / Kat, *s. f.* } goat, *vulgar.*
Khon, or khonwath, elbow.

L.

Layun, layu, to beat, *(lay on)*. *laya, regular.*

Lagun, *f. p.* lajís, *imp.* lag, *gyin*, lagmut, lajmitz. } *attach* *lagna.*

Larun, laryau, yaye, run after.

Lá'bun, to find.

Ladun, to send (a thing.)

Ladmut, to put (a thing), into (Lazmits, to hang), up or put a thing up or build, &c.

Likhun, or Lékhun, Likhmut, hichh'mits, } to write.

Ledun', *v.* (in sco,) be cowardly.

Lasun, *v. a.* to live.

M Lat. *f. a.* a time, pl. *lata.*

Lór *s. f.* stick.

Led, *adj.* cowardly, indeclinable.

Lär *s. f.* house.

Lar, *s. f.* fighting, *thread.*

Loh, *s. f.* caracal.

Liul, *s. m.* large earthen pot.

Leji, *s. f.* small ditto.

Lang, *s. m.* thigh, large brand.

M.

Mangun, to demand, in *f. g.* changed to j., maugmut, maujmits.

Mathun, to rub, *f.* mots.

Mashun, to forget.

Muthmút.

Mathmits.

Mashráwan, to forget.

Máránwatul, sweeper.

Maúl, father.

Maij, mother.

Múth, mut, forgetful.

Mandáct, modesty.

Mal, *s. m.* (Arabic), property.

s. f. necklace.

Mok,hta, *s. m.* pearl.

Mauchh, *s. m.* honey.

——— tilo, *s. f.* honey bee.

Minyamar *s. f.* hind, (form of Hangal.)

Musht, *s. f.* blow.

Moth, *s. f.* handful.

aply apl., chi, handle.

Mudr, sweet.

Mur, *s. f.* fowl-house.

Mar, serai.

Mast, *s. m.* hair of the head.

Mäts, arm.

N.

Nag, *f.* eye.

Nag, *n.* lead.

Nerun, *v. int.* to go out, irregular,

past, drao and *imp.* ner, niri put pethydráümut nemwun.

past participle, nirit.

Nyún, to bring, as yun, nyu, nuj.

f. p. nyumut.

Nawun, be born, be near,

v. (in esco.) Ho.

Nawráwan, to make new.

v. a. invent (a story.)

Nahun, *v. a.* } to obliterate.
Nashun, } (obsolete.)

Nyikun, to become thin (in sco.)

Nikráwan.

Nal tsunun, to wear.

Nichu, child.

Nauga. } naked.
Nithnan. }

Nath-nati, *s. f.* trembling.

Naw, nivi, new.

Navyar, newness.

Nakh, *s. m.* shoulder,

Nakha. } near.
——— tal. }

Nai, *conj.* if not.

Nyatr, marriage.

Nyúk. } thin.
Niki. }
Nich. }
Nichha. }

Nichhar, thinness.

O.

Onguj, *s. f.* finger.

Ongul, *s. m.* finger's breadth.

P.

Pushurun, *v. r.* to make over.

Parun, *v. a.* to read,

Pyun, to fall.

Pyau, } pyai.
Peyi, } peyi, (as gatsun.)

Páwan, to throw, (find sometimes.)

Parzanun, } recognise.
or }
Parzanáwun, }

Pránun, *v. n.* (in esco) be old.

Pazi, a *defective verb*, signifying or to be made, be sure, or proper.

Paz, *s. m.* truth, pazi, *f.*

Puzyár-ing, true.

Pish, flea.

Periga, *s. f. arzun, chhini*, millet.

Poribar, *s. f.* shawl.

Put, *s. m.* } plank,
Pett, pachhi, *s. f.* } *f.* small.

an, *m.* leaf, thread.

Pán, self.

Patsh, trust, belief.

Parzán, acquaintance.

Posh, flower.

P.

Prarun, *v.* (in sco.) to wait, for.
Presun, *v.* to bring forth, object.
Pyayi.

Prájï, *s. f.* straw.
Pránun, old.
Páth durib, manner.
Pütsalau, fox.
Prat, every, (as every day, prat dolu.)
Parbat, *s. m.* hill.
Padü, *s. m.* sole or print of foot.
Pâz, hawk in *agentive case*, paz *not pazan.*

PH.

Phérun, *v. n.* return.
phyor.
phyír.
Phirun, *v. a.* turn.
Phalun, to grow old, *f.* phaji, also to assess; phylana, clothes.
Phalwun, *h* in *fem.* transition of the above.
Phulun, to flower.
Phulanawan, transitive.

Phamb, *s. m.* cotton or shawl wool.
Phras, *s. m.* poplar.
Phyur, *s. m. pl.* phíri, dress branch of flowers.
Phyük, *s. m.* shoulder.

R.

Ráwun, *v. n.* to lose, lost to.
Rawrawun, *v. a.* to lose.
Riwun, *v. n.* to success, especially in kishtawár ryü.
Ruchhun, to keep.
Rachhit thawán, to take care of.
Ranun, to cook.

Rats, *s. f.* night.
Rus, *s. m.* } deer.
—— kat, infl. ch. *f.* }
Rátnahún, wolf.
Rúd, *s. m.* rain.
Rwáh, *s. m.* fault.
Rët, *s. m.* month.

S.

Sozan, to send a man.
Saman, samyou, to assemble.
to samyaiÿü, to unite, resemble.

Swan, *s. m.* gold, a second. *s. f.* the relationship of one wife to another, *amabák.*

S

Shubun, to be fit, proper or rather, or becoming.
Súwun, *v. a.* to sew.

Samatsár, participal acting, from Saman, meaning *united.*
Suit, *s. m.* wax (more generally used.)
Säh, lion.
Siming, lioness.
Swar, *v. a.* slow music.
Sangur, *s. m.* mountain.

SH.

Shungun, Shong, Shurúg, Shwinj, Shwinja, to sleep.

Shála, *s. m.* Pan. italicum, millet.
Shur, *s. m.* a child of either sex.
Shichh, information.
Shál, jackall.

T.

Tráun, *v. a.* to leave off.
Tráwanáwaṅ, to make, to leave off.
Trawit tsunun, to throw away.

Tamul, *s. m.* rice uncooked or tuna, when used with phalle.
Tarukh, *s. m.* star.
Tilr, *s. f.* bee, wasp.
Táüth, *adj.* Taithi, *m.* love, friendship.
Taith, Tachha, *f.*
Tyuth, tuh, bitter.
Tinj, *s. f.* string, (to tie, dyún,) to give.
Tál, *s. f.* talyun, *s. m.* top of head, *s. m.* gum of mouth.

TH.

Thawun, to place.
Thurun, to make, *form.*

Thäri, *s. f.* bush, bushy plant.
Thar, *s. f.* back.
Thíya, in presence of, evidently.

T.

Tikun, to run, *n.* haste.
Tikyou, tikyye, *v.*

TH.

Thahrun, *v. n.* } to stop.
Thahrawan, *v. a.* }

TS.

Tsadun, to call, regular.

Tsanun, to cast, regular, strike, like anun.

Tsalun, tsalmut. tsajmits. } runaway, go away.

Tsanun, *v. a.* bring in.

Tsetun, *v. a.* to tear, interrupt, to borrow, settle, &c. &c. قطع

Ts,henun, *v. i.* to be torn.

Tsissun, to hide, ارطاع

Tsokun, *v. (sco.)* be acid.

Tsapa, silence.

Tsandar, *s. m.* new moon.

Tsetas, remembrance, used with yun and pyun, to recollect; tháwan, to remember.

Tsor, mtser, *m. f.* more, tsetun, *f.* hen sparrow.

Tsak, *s. f.* anger, used with k,hasun and yun.

Tsep, *verb neu.* hiding from a person.

Tsai, properly, *shade.*

Tsäud, blow.

T,shawul, } *s. m.* { goat.
———uj, } *s. f.* {

Tsér *s. m.* lateness, or *s. f.* apricot.

Tsór, four.

Tsuk, acid.

Tswakyar, acidity.

U.

Uphun, to fly.

V.

Viyinj, *s. f.* fairy.

W.

Wathun, ——— wuthmut, ——— witsmits, } to stand up.

Wasan, ——— wathmut, ——— wathmats, } to come down.

Wothirun, to clean.

Watharun, to spread.

Wuzmal, *s. f.* lightning.

Wushka, *s. f.* barley.

Wodinya, or Wotadinya, } *indeclinable*, standing.

Wathmn, carpet.

Wari, *s. m.* inflected Wahras or Warihas. } year.

W.

Wodun, *v. n.* weep.
Wōnun, to weave.
Wōwun, to sow.
Wudun, to fly.
Wushinun, to become warm.
Wyethun, to become fat. (in sco.)
Wyethráwan, to fatten.
Walan, to cover (as with clothes.)
Wáyun, to plough.

Waius, *s. f.* ages, years (only to a number.)
Wazum, *adj.* loan, agreeing with the substance lent, used with dyun, hyun, or tsatun.
Wachh, *s. m.* breast.
Wäd, *s. f.* head (to)
Vyuth, Vyith, *s. f.* Vyechhis, *f. p.* } fat.
Vyechar, fatness.
Wal, *m.* hair.

Y.

Yetsun, *v. a. r.* wish.

Yer, *s. m.* wool.
Yachh, *adj.* indeclinable, bad, ugly
Yed, *s. f.* belly.
Yél, overcoming.

Z.

Zún, *s. f.* moon.
Zú. *s. m.* life.
Zúhar, length.
Zýuth, *m.* elder (brother.)
Zithi or zith, *f.*
Ziche.
Zárpár, excuses.

Zanún, *v. n.* to know.
Zenun, *v. n.* to win.
Zyonŭ.
Zenyi.
Zethun, *v. i. ch.* to become, or belong.
Zechhar, length.
Zichhar, elderness, being older.
Zal, *s. m.* not.
Zalún, *v. a.* to burn.
Zalún, to have a certain disease in the breast? (a cough ?)
Zýun, (probable zu and yun), to be born, to be curdled.
Zaorun, *v. a.* to beget, curdle.
Zaorum, regular.
Zang, *s. f.* leg (the whole.)

ADVERTISEMENT.

The "Palæologica" I published in the year 1832, as well as my work on fossil bones of the country of Georgensgmünd (1834) and my palæontological treatises contained in the Transactions of Academies and various Natural Societies, were so favourably received, that since some years I have been honoured with specimens of similar fossil organic remains of a former world, which on examination, offered important matter for results about fossil bones of the Mammalia, Reptiles, and Birds. Whilst these rare treasures were imparted to me by public and private collections of Germany, Switzerland, and the adjacent countries, with a readiness deserving every encomium, I am requested from different parts, not to publish my inquiries separately, but in a particular work. In order to satisfy such unbounded confidence and kind desire, I am willing to advance a work under the above title referring to the Fauna of a primitive world, which will contain my inquiries about fossil bones. As it is impossible to give a complete insight with this advertisement, it will suffice, to form a judgment of its worth, by citing, that this work, among the rest, will treat—of fossil bones of Pachydermata (Mastodon, Rhinoceros, Palæotherium, Dinotherium, Tapir, Microtherium, &c.), Ruminantia (Palæomeryx, Orygotherium, &c.), Rodentia (Lagomys Oeningensis), Carnivora (Harpagodon, Pachyodon, &c.), Tortoises, Sauriens, Frogs, and Birds, which have been found in beds of Lignite or Brown-coal in Switzerland and in other deposits of Molasse in this country, as well as in the pits of pisiforme Iron ore or Möskirch, in the calcareous marl near Oeningen, the gypsum near Hohenhoven, in the strata near Weisenau, and in other tertiary strata; of the skeleton parts of the marine Mammalia, called by me Halianassa, which very well designates the upper tertiary formations of our part of the world; of remains of Sauriens, Tortoises, and Birds from the cretaceous group (in the canton of Glaris, &c.); of the Plateosaurus from the Keuper; of the teeth of the Ischyrodon; of Sauriens and Tortoises from the famous formation of the lithographic limestone of Solenhofen; by the co-operation of the President Baron Andrian and the Count Münster, of the re-

markable Sauriens of Muschelkalk (Nothosaurus, Pistosaurus, Charitosaurus, &c.); and of the other fossil vertebrated animals.

As to the present eager pursuit of historical investigations about the constitution of the earth and the development of its organic types of animal life, there can be no better evidence than the remains of animals in the crust of the earth, amongst which the vertebrated animals are no doubt of the greatest importance. Thus if we add the creatures produced by the earth in a primitive age to the number at present only, we are able to estimate the riches of the whole creation, and to explain the alternations resulting from the sublime laws of nature. I am confident, therefore, that the publication of a work like this, containing anatomical and geological discoveries of a former world, will be readily promoted.

The work will appear in several numbers, the price of which shall be calculated, as is customary with such works, after the number of sheets in German, printed in Latin letters in gr. 4°, and according to the number of tables in fol°. with plates after my own drawings, or executed after my immediate direction. As gain is not the object of this publication, the lowest price cannot be determined before I know the number of subscribers; the number of copies will not exceed much the number required, and the price in every case, will not be higher than that of similar works. The subscribers will please to send their direction to the author by the post, or by well known libraries, but plainly written. The list of subscribers will be joined to the work.

Herman von Meyer.